DOCUMENT RESUME

ED 461 559 SO 028 465

AUTHOR	Snyder, Sarah A.
TITLE	Sustainable Development. Teacher's Guide to World Resources. Comprehensive Coursework on the Global Environment.
INSTITUTION	World Resources Inst., Washington, DC.
SPONS AGENCY	Geraldine R. Dodge Foundation, Morristown, NJ.; United Nations Educational, Scientific, and Cultural Organization, Paris (France). Environmental Education Section.; National Geographic Society, Washington, DC.
ISSN	ISSN-1076-7657
PUB DATE	1994-00-00
NOTE	58p.; For related "Teacher's Guide to World Resources" documents, see SO 028 456-466. Mary Paden was editor.
AVAILABLE FROM	World Resources Institute, 1709 New York Avenue, NW, Washington, D.C. 20006. Tel: 202-638-6300.
PUB TYPE	Guides - Classroom - Teacher (052)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Conservation (Environment); Developing Nations; Development; Foreign Countries; *Futures (Of Society); *Global Education; Interdisciplinary Approach; Science and Society; Secondary Education; Social Studies; *Sustainable Development; Teaching Guides
IDENTIFIERS	Canada; New Zealand; Tanzania; Thailand

ABSTRACT

This teacher's guide presents teaching suggestions and presentation materials about sustainable development, important trends that could lead to human and environmental disasters in the future if they continue unchecked, and how each country has a different path to sustainable development. The lesson is divided into six parts and may be completed in two or more class periods as desired. Student handouts include: (1) "Facts about Global Warming and Ozone Depletion"; (2) "National and International Efforts toward Sustainable Development"; (3) "Defining Sustainable Development"; (4) "Indicators of Sustainable Development"; (5) "Case Study: United States"; (6) "Case Study: Thailand"; (7) "Case Study: Tanzania"; and (8) "Planning for Sustainable Development." Transparency masters are titled: (1) "Trends and Projections in World Population Growth, 1750-2050"; (2) "Projected Population of the World, 1990-2150"; (3) "Trends in Deforestation and Population Growth, 1850-1980"; (4) "Soil Degradation as a Percent of Vegetated Land, 1945-90"; (5) "Global Fossil Fuel Consumption, 1950-90"; (6) "How the Greenhouse Effect Works"; (7) "Atmospheric CO2 Concentrations, 1860-1990"; (8) "Stratospheric Ozone Depletion, 1979-91"; (9) "The Road to Sustainable Development"; (10) "U.S. Motor Vehicle Trips by Purpose and Length, 1983-84"; and (11) "Comparison of Gasoline Prices and Motor Vehicle Use." (EH)

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TEACHER'S GUIDE

Sustainable Development

ED 461 559

SO 028 465

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Acknowledgments

We gratefully acknowledge the support of the Geraldine R. Dodge Foundation, the UNESCO–UNEP International Environmental Education Program (IEEP), and the National Geographic Society for support of these units.

Teacher's Guide

to

World Resources:

Sustainable Development

Comprehensive Coursework on the
Global Environment

World Resources Institute
1709 New York Avenue, N.W., Washington, DC 20006

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The World Resources Institute (WRI) is a research and policy institute helping governments, the private sector, environmental and development organizations, and others address a fundamental question: How can societies meet human needs and nurture economic growth while preserving the natural resources and environmental integrity that make prosperity possible?

Through its policy studies, WRI aims to generate accurate information about global resources and environmental conditions, analyze emerging issues, and develop creative yet workable policy responses. In seeking to deepen public understanding, it publishes a variety of books, reports, and papers; undertakes briefings, seminars, and conferences; and offers material for use in educational settings and in the news media.

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Printed in the United States of America on Recycled Paper

World Resources Institute
1709 New York Avenue, N.W.
Washington, D.C. 20006
ISSN 1076-7657

Using World Resources Teacher's Guide Units

World Resources *Teacher's Guide* Units are designed for use at the secondary school level (although we have reports of successful use at the middle school and college levels). They weave together lessons about both environment and development, both globally and locally. They draw on skills and knowledge from the physical and biological sciences, social studies, history, economics, civics, and global studies.

Information and analysis used in the Units are drawn from World Resources Institute (WRI) publications and databases. All units are written by curricula writers and reviewed by educators as well as by technical experts. The Units are updated and revised periodically based on feedback from classroom teachers who have used the materials.

Our intent is to provide easy-to-use, inexpensive classroom materials that contain the most recent and authoritative information on the global environment because we believe it is crucial that the next generation of leaders and citizens understand the issues described here.

The complete set of *Teacher's Guide* Units includes the following topics:

- Biodiversity
- Car Trouble
- Citizen Action
- Energy, Atmosphere, and Climate
- Natural Resource Economics
- Oceans and Coasts
- Population, Poverty, and Land Degradation
- Sustainable Development
- Two Giants: China and India
- Watershed Pollution
- Women, Equity, and Sustainable Development

These units have been revised and updated with the most recent data available as of spring 1994.

Inside Each Unit

Each *Teacher's Guide* Unit should contain enough teaching suggestions and presentation materials to teach one to several classes on the topic without securing additional resources. On the other hand, each unit is designed to point teachers and students to additional resources and to offer suggestions for expanded coursework. Specifically, each unit contains objectives, a lesson plan, student handouts, overhead transparency masters, student enrichment activities, suggestions for further reading, and suggested audiovisual resources.

Using the Units for Environmental Studies

The *Teacher's Guide* Units provide a comprehensive, consistent yet highly flexible set of materials for environmental studies courses. They can be used in conjunction with an environmental science textbook to give students an understanding of basic environmental systems and cycles. Or they can be used in a social studies context to examine some of the tough problems and choices we face as a society.

Educators who want to go beyond the *Teacher's Guide* Units can read related WRI publications, which provide the basic data, source materials, and analysis for the Units. These publications are listed at the beginning of each unit. A free catalog can be obtained by calling 1-800-822-0504.

Integrating Teacher's Guide Units into the Curriculum

Secondary school teachers frequently mention the difficulty of integrating environmental issues into a tightly packed curriculum. As much as they would like to teach about the environment, they must devote class time to required subjects.

To help them place these issues in their curricula, we have coded each lesson plan and each student enrichment activity to the draft national performance assessment standards for science, math, history, civics, and geography. These standards are being developed as part of the national Goals 2000 program in the U.S. Department of Education. The standards themselves are being developed, discussed, and revised by educational organizations in nine academic disciplines. They are expected to be approved at the national level, then offered to states to incorporate into their own academic assessment plans. Although this process will take several years, we have compiled lists of assessment standards for grades 9 through 12 from drafts available in spring 1994 to offer some guidance to teachers.

A complete list of the draft standards for Grades 9 through 12 appears in Appendix B, which should be mailed to you with your order. Appendix A provides a bibliography and list of related organizations.

Integrating Global Environmental Education into High School Curricula

In an effort to link lessons about global environment and development issues to required school curricula, we have identified which pages of the lesson plan and which student enrichment activities in this *Teacher's Guide* Unit relate to the draft national performance standards developed recently for civics, geography, history, math, and science in grades 9 through 12.

These voluntary national standards are part of the Goals 2000 program mandated by the Goals 2000: Educate America Act of 1994 under the direction of the U.S. Department of Education. Among other things, Goals 2000 will establish a set of goals or performance standards for grades 4, 8, and 12 in the subjects listed above plus English, the arts, and foreign languages. These goals will be available to the states for incorporation into their own sets of educational performance standards. Each set of draft standards was developed by a professional education organization and has been presented at numerous educational conferences for review and comment. The draft standards used here are those available as of spring 1994.

Although many countries have national performance standards, the United States (and Canada) have treasured a decentralized educational system that sets education goals at the district or state level. Goals 2000 is the first attempt to identify a set of general education objectives that all students in the country are expected to achieve. As might be expected, there is some controversy over whether there should be national education goals—even voluntary ones—and if so, what they should be.

Regardless of the final outcome, we feel the draft goals do reflect some consensus among educators about what material should be covered at various grade levels, and as such, offer some guidance for integrating environmental education into the curricula.

Only those goals relevant to this unit are listed here. A complete list of goals appears in the 1994 *Teacher's Guide to World Resources*. Copies of reports outlining the goals for each subject area can be obtained from the education organizations listed at the top of each set of goals on this page. Information about the Goals 2000 program is available at 1-800-USA-LEARN.

Goals 2000: Draft National Performance Standards

Civics and Government*

(Draft National Standards, October 1993, Center for Civic Education, 5146 Douglas Fir Road, Calabasas, CA 91302-1467)

	Lesson Plan	Enrichment Activity
III. How Does the Government Established by the Constitution Embody the Principles and Purposes of American Democracy?		
6. How is public policy formulated and carried out?	8, 9	
IV. What is the Relationship of American Politics and Government to World Affairs?		
1. How is the world organized politically?	5-9	4
2. How do the domestic politics and the constitutional principles of the United States affect its relations with the world?	4, 8	
3. How has the United States influenced other nations and how have they influenced American politics and society?	4, 8	
V. What are the Roles of the Citizen in the American Political System?		
2. What are the rights of the citizen?		4
3. What are the responsibilities of citizens?		4
4. How can citizens participate in public life?	9	

Note: Only the education goals relevant to this unit are listed.

History*

(Draft National Standards, October 1993, National Center for History in the Schools at UCLA, 231 Moore Hall, 405 Hilgard Avenue, Los Angeles, CA 90024)

	Lesson Plan	Enrichment Activity
I. Historical Chronology		
1. Distinguish between past, present, and future time.	2	
IV. Historical Analysis		
1. Compare and contrast differing sets of ideas, values, personalities, institutions, etc. by identifying likenesses and differences.		3, 4
5. Hypothesize the influence of the past on the present.	2, 8, 9	

Geography*

(Draft National Standards, October 1993, National Council of Geographic Education, Geography Standards Project, 1600 M Street, NW, Washington, DC 20036)

	Lesson Plan	Enrichment Activity
I. Seeing the World in Spatial Terms		
1. Knows and understands how to use maps, globes, and other graphic tools and technologies to acquire, process, and report information from a spatial perspective.	5-7	1, 4, 5
3. Knows and understands how to analyze the spatial organization of the Earth's surface.		4
III. Physical Systems		
8. Knows and understands the characteristics and distribution of ecosystems on Earth's surface.		4
IV. Human Systems		
9. Knows and understands the characteristics, distribution, and migration of human populations on Earth's surface.	5-9	1, 4
10. Knows and understands the nature and complexity of Earth's cultural mosaics.	5-8	
11. Knows and understands patterns and networks of economic interdependence on Earth's surface.	4-9	1, 4
12. Knows and understands the processes, patterns, and functions of human settlement.	2, 5-9	1, 4, 5
13. Knows and understands the forces of cooperation and conflict that shape the divisions of Earth's surface.	6-8	4
V. Environment and Society		
14. Knows how Earth's dynamic physical and human systems are connected and interact.	2-9	1, 3, 4
15. Knows the consequences of the interaction between dynamic human and physical systems	2-9,	1, 3, 4
16. Knows changes in the meaning, distribution, and importance of resources.	2-9	1, 3, 4
18. Knows and understands how to apply geography to interpret the present and plan for the future.	7	4

Mathematics*

(Draft National Standards, March 1989, The National Council of Teachers of Mathematics, Order Processing, 1906 Association Drive, Reston, VA 22091)

	Lesson Plan	Enrichment Activity
I. Mathematics as Problem Solving		
1. Use, with increasing confidence, problem-solving approaches to investigate and understand mathematical content.		2, 4
2. Apply integrated mathematical problem-solving strategies to solve problems from within and outside mathematics.		2, 4
4. Apply the process of mathematical modeling to real-world problem situations.		4
X. Statistics		
1. Construct and draw inferences from charts, tables, and graphs that summarize data from real-world situations.	2, 3, 5, 6	1, 2
4. Understand sampling and recognize its role in statistical claims.		2
5. Design a statistical experiment to study a problem, conduct the experiment, and interpret and communicate the outcomes.		2
XI. Probability		
1. Use experimental or theoretical probability, as appropriate, to represent and solve problems involving uncertainty.		4
2. Use simulations to estimate probabilities.		4

Integrating Global Environmental Education into High School Curricula—*continued*

Science*

(Draft National Standards, February 1994, National Academy of Sciences, National Research Council, 2101 Constitution Avenue, NW, Washington, DC 20418)

	Lesson Plan	Enrichment Activity
I. Science As Inquiry		
2. Design and conduct full scientific investigations and communications.		2
III. Life Science		
1. Biodiversity	2, 8	3, 4
3. Genetics and Molecular Biology		3
4. Ecosystems and Human Ecology	2-9	1-6
6. Growth, Development, and Differentiation		3
7. Maintenance of a Dynamic Equilibrium		4
IV. Earth & Space Science		
2. Biochemical Processes/ Cycles in Earth Systems	3	
V. Unifying Concepts And Processes Of Science		
3. Equilibrium		4
VI. Science and Technology		
1. Problem Identification	2-9	2, 4, 6
2. Solution Design-Cost, Risk-Benefit Analysis	6, 7	4
3. Solution Implementation		4
4. Solution Evaluation	4, 6-8	3, 4
VII. Science and Societal Challenges		
1. Population Growth	2, 4-8	1, 4
2. Natural Resources	2-9	1-7
3. Environmental Degradation	2-9	1-7
4. Natural and Human-Induced Hazards	3-9	1-3, 6
5. Community Health	5-9	1, 3, 6, 7
6. Global Change	2-9	1, 2, 4

Sustainable Development

Sustainable development is a new, confusing, and controversial concept. If it is to become a reality on a local, national, and global scale, new priorities must be set, new decisions made, and new programs and policies created. This lesson explores some of the possibilities.

The lesson begins by considering important trends that could lead to human and environmental disasters in the future if they continue unchecked. The concept of sustainable development is presented as a way of responding to these disturbing trends. The path to sustainable development is different from one country to the next. Each country must begin sustainable development from whatever stage of development it has reached at the moment. So, students first examine sustainable development in three different settings (industrialized, rapidly industrializing, and poor countries) and then analyze case studies of specific countries. At the conclusion of the lesson, students are asked to consider how sustainable development might affect their own lives.

Objectives

By the time they finish this lesson, students should be able to:

- Describe trends in population growth, environmental degradation, and economic development that are causes for concern.
- Define sustainable development.
- Identify and describe the four dimensions of sustainable development, and defend each as an important dimension of sustainable development.
- Distinguish between those types of data that serve as good indicators or measures of a country's progress toward sustainable development, and those that do not.
- Identify national/international strategies for pursuing sustainable development.
- Identify lifestyle/local strategies for pursuing sustainable development.

Teaching Strategies

This lesson is divided into six parts. Allow one class period for a quick overview of the topic or several class periods if you wish to pursue any of the topics in greater detail or add activities. The lesson includes the following materials that may be duplicated:

Student Handouts:

1 Facts About Global Warming and Ozone Depletion
2 National and International Efforts Toward Sustainable Development
3 Defining Sustainable Development
4 Indicators of Sustainable Development
5 Case Study: United States
6 Case Study: Thailand
7 Case Study: Tanzania
8 Planning for Sustainable Development

Overhead Transparency Masters:

1 Trends and Projections in World Population Growth, 1750–2050
2 Projected Population of the World, 1990–2150
3 Trends in Deforestation and Population Growth, 1850–1980
4 Soil Degradation as a Percent of Vegetated Land, 1945–90
5 Global Fossil Fuel Consumption, 1950–90
6 How the Greenhouse Effect Works
7 Atmospheric CO_2 Concentrations, 1860–1990
8 Stratospheric Ozone Depletion, 1979–91
9 The Road to Sustainable Development
10 U.S. Motor Vehicle Trips by Purpose and Length, 1983–84
11 Comparison of Gasoline Prices and Motor Vehicle Use

Beginning the Lesson

The world today faces a variety of critical environmental threats. At the same time, it faces enormous human problems in the form of widespread, persistent poverty and human misery—despite growing affluence for many.

Use a series of transparencies made from overhead masters to give a brief introduction to the lesson. (Note that in some masters, the data through 1990 are not yet available.) One of the most basic trends that threatens to make these environmental and human problems worse is the increase in global population, which is projected to reach 11 billion by 2100, twice its current size.

Overhead Transparency Master 1, "Trends and Projections in World Population Growth, 1750–2050," provides a historical look at the world's population and illustrates the enormous changes that have taken place in the last two centuries. **Overhead Transparency Master 2, "Projected Population of the World, 1990–2150,"** illustrates five possible projections of population growth in the future.

World economic activity has also grown—at about 3 percent per year since 1950. If this rate continues, the world economy will be five times larger in the year 2050 than it is today. This growth in population and economic activity has the potential to increase dramatically the pressure on natural resources and natural systems that are already suffering serious levels of degradation.

Overhead Transparency Master 3, "Trends in Deforestation and Population Growth, 1850–1980," shows that as population has increased, both temperate and tropical forests have decreased. Forest land has been converted to agricultural use. Timber has been cut to meet needs for housing, paper, and other wood products, as well as fuel.

There is little land left for agricultural expansion, and human activities are degrading a significant portion of the world's productive lands, as is shown in **Overhead Transparency Master 4, "Soil Degradation as a Percent of Vegetated Land, 1945–90."**

Another important trend is shown in **Overhead Transparency Master 5, "Global Fossil Fuel Consumption, 1950–90."** Fossil fuels (oil, natural gas, and coal) provide about 95 percent of the commercial energy used in the world economy, and their use is growing worldwide at the rate of 20 percent per decade.

You may wish to show **Overhead Transparency Master 6, "How the Greenhouse Effect Works,** and pass out " **Handout 1, "Facts About Global Warming and Ozone Depletion."**

Burning fossil fuels emits carbon dioxide into the atmosphere (as does deforestation) and the Earth's carbon cycle is being stressed. Atmospheric concentrations of carbon dioxide are increasing at 0.5 percent per year. **Overhead Transparency Master 7, "Atmospheric CO_2 Concentrations, 1860–1990,"** shows this increase, which has caused concern because of the possibility of climate change. It is feared the increasing carbon dioxide levels will enhance the greenhouse effect, resulting, on average, in an additional warming of the Earth's surface.

Also of concern is the way human activities are affecting the protective layer of stratospheric ozone, which absorbs much of the sun's damaging rays. **Overhead Transparency Master 8, "Stratospheric Ozone Depletion, 1979–91,"** illustrates these significant ozone losses. Recent measurements indicate that peak ozone destruction (during polar spring) has reached 60 percent over Antarctica. Significant ozone losses have also been found at mid-latitudes (45° corresponds to Christchurch, New Zealand in the south and Minneapolis, MN in the north). There are also indications of a thinning of the ozone layer in the Arctic over the North Pole and northern Canada.

Defining Sustainable Development

The world is headed toward a variety of potential human environmental disasters if nothing is done to change course. But there is hope. In the last 20 years, the world has started to recognize that environmental problems cannot be separated from those of human welfare and from the process of economic development in general. Many forms of development are eroding the environmental resources on which people's welfare and livelihood depend.

One attempt to begin the process of change is the United Nations Conference on Environment and Development (UNCED). The June 1992 conference was a forum in which world leaders began to

formulate strategies and agreements for sustainable development. In recent years, several national and international efforts toward sustainable development sprung from the Earth Summit. **Handout 2, "National and International Efforts Toward Sustainable Development,"** describes some of the major organizations devoted to sustainable development.

Distribute copies of **Handout 3, "Defining Sustainable Development."** Point out the general definition of sustainable development at the top of the handout. Then, explain that sustainable development can be thought of as a process requiring simultaneous progress in four dimensions: economic, human, environmental, and technological. These four dimensions are outlined in the handout. Discuss some of the specific goals within each dimension, making sure that students understand the terminology.

Show a transparency made from **Overhead Transparency Master 9, "The Road to Sustainable Development."** It is important to point out to students that the path toward sustainable development will be different for each country, depending on its history, government, political situation, natural resources, etc. In sub-Saharan Africa, sustainable development may mean improving the human condition by bringing health and education services to the people, while in Europe, it may mean limiting emissions that damage the ozone layer and cause acid rain.

Before countries can begin setting goals for sustainable development, they must assess where they are now. Ask students to suggest ways to measure a country's environmental health? Economic development? Human development? Technology? (Possibilities could include levels of air and water pollution, or natural resources in reserve. Or, measures of human development such as life expectancy, nutrition, employment.)

Unfortunately, data for some of the best indicators, and some that students will probably suggest, are not available. And so, based on the worldwide data that are available, we have selected the following indicators to measure progress toward sustainable development: **gross national product (GNP) per capita, energy consumption per capita, under-five mortality, and fertility rates.**

GNP is the traditional measure of the health of an economy, but it doesn't take into account the depletion or destruction of natural resources. The *Exxon Valdez* oil spill actually boosted the GNP of the United States. GNP per capita provides a more comparative figure, but is only an average figure. It does not reveal income gaps between rich and poor.

Energy consumption per capita is one measure of both the state of a country's industrial development and the amount of carbon it contributes to global warming.

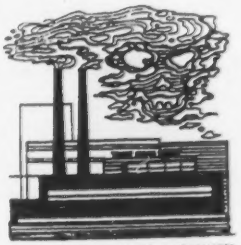
The under-five mortality rate is a good measure of the general health of the population. It reflects access to health services, levels of nutrition (especially among pregnant women, infants, and children), education (especially female literacy), and general socioeconomic status. It also measures environmental problems—children are the most fragile

members of society, and thus, the most vulnerable to disease and environmental stress.

The fertility rate is a good measure of human development because it is related to the health and welfare of women. Usually, as women have access to education, health care, and effective contraception, they have fewer children.

Distribute copies of **Handout 4, "Indicators of Sustainable Development."** This handout identifies specific measurements used to indicate different aspects of development. A note for each graph defines key terms.

Three groups of countries are shown: the **industrialized** countries (high-income countries that also rank high in human development—the United States, for example), the **rapidly industrializing countries** (known as "RICs," those that have strong industrial sectors but do not rank high in human development—Thailand, Indonesia, Malaysia, Mexico, Brazil, and Chile), and the **developing** countries (low-income, primarily rural countries that rank low in human development—by World Bank estimates, there are at least 40 such poor countries).



<- Courtesy Smith From "RESOURCES"

The most accessible data for industrialized countries come from countries belonging to the Organisation for Economic Co-operation and Development (OECD). These include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. [Note that data for industrialized countries do not include Central Europe and the former Soviet Union; data for poor countries do not include India and China (countries with very poor rural populations but with vigorous industrial sectors). In addition, data have not been included for newly industrialized countries such as Hong Kong, Singapore, South Korea, and Taiwan.]

As you discuss the graphs with students, ask them to describe the trends and to state differences among the groups of countries. For example:

- For the past 20 years, GNP per capita has grown significantly in the industrialized countries and also in the RICs and low-income countries. But there is an enormous gap between rich and poor that is not only increasing but becoming much more obvious because information and television images are widely communicated. What might be some of the consequences of a growing gap in GNP between rich and poor countries? What happens when the rich get richer and the poor get poorer, as is happening in the United States?
- People in the industrialized countries use much more energy than do those in the rest of the world. (An average U.S. resident uses as much energy as 11 Thais, 23 Tanzanians, or 40 Ethiopians. Energy use is growing in the RICs but at a much lower level. Many low-income countries still use very little commercial energy.
- All countries have reduced child mortality over the past 20 years. Some low-income countries still have very high child mortality rates.

- For most of the past 20 years, fertility rates in industrialized countries have been stable at nearly a replacement rate (about two births per woman). Fertility rates in the RICs have declined significantly. Fertility rates in low-income countries are still very high and have declined only slightly over the period.

Analyzing Case Studies

What a country might do to start down the path to sustainable development depends on the country's current level of development. Needs, resources, and priorities vary from one country to another. To get an idea of this variety and of some of the possibilities, have students analyze three case studies.

Divide students into three groups. Give one group copies of **Handout 5, "Case Study: United States;"** another group, copies of **Handout 6, "Case Study: Thailand;"** and the third group, copies of **Handout 7, "Case Study: Tanzania."** Give each group copies of the worksheet, **Handout 8, "Planning for Sustainable Development."** Students should also have copies of **Handout 3, "Defining Sustainable Development."**

Step 1: Defining Current Status

Have students work in their groups to analyze the *current status* of their country in terms of the four dimensions of sustainable development: economic, human, environmental, and technological. Case studies contain information in both the narratives and graphs that students will find helpful. Students can use additional information and data from *World Resources 1992-93* as well as other reference materials from the classroom or library. Each group can record their information on **Handout 8, "Planning for Sustainable Development."**

Then, have each group report back to the class. Discuss the differences among the levels of development, environmental problems, use of energy, etc. in the three case studies so that students begin to see the distinctions between the industrialized, rapidly industrializing, and developing countries.

Step 2: Defining Sustainable Development Goals

Next, have students meet in their groups again to choose some *sustainable development goals* that are appropriate for their case study country, based on the current status of the economic, human, environmental, and technological dimensions. **Handout 3, "Defining Sustainable Development,"** is a useful reference. Have the students consider which goals they should begin with and what their countries will need to get started. (Money, obviously, but what other elements would be needed? Record the goals and other comments on **Handout 8.**

After students have chosen some goals, have each group report its goals and discuss them. Do any of the groups have similar goals? Students will probably choose sustainable goals along the lines of the general goals outlined below. However, these are only suggestions and class discussion need not be oriented around these goals.

Economic Dimensions

- All countries need to concentrate on controlling pollution and reducing waste.
- Industrialized countries need to reduce wasteful levels of consumption of energy and other natural resources through improvements in energy efficiency and changes in lifestyle.
- RICs have an opportunity to get clean technologies in place as they develop their industrial sectors.
- Developing countries, which depend on agriculture for most of their GNP, must be especially careful to conserve their soil and water resources so that their fields will remain productive.

Human Dimensions

- All countries need to work on meeting basic needs in health, education, clean environment, and equal participation of women and minorities.
- Industrial countries have a high literacy rate, but some have uneven distribution of health care. Their populations are mostly stable.
- RICs have achieved high literacy, improved health care, and, while still growing, their populations are leveling off.
- Developing countries, on average, are behind the other groups in health care, literacy, and equity. They must concentrate on their human resources if they are to develop the healthy, literate work force necessary for economic development. Rapid population growth has put increasing stress on services and resources.

Environmental Dimensions

- All countries need to improve environmental protection.
- Industrialized countries need to be more concerned with air pollution and efficient use of resources.
- Developing countries need to be concerned with basic conservation of renewable resources such as soil, water, and forests, upon which their economies are based.

Technological Dimensions

- Industrialized countries need to convert to more efficient technologies.
- RICs have an opportunity to develop with more efficient technologies.
- Developing countries are mostly still agriculturally based economies. They need to develop small-scale appropriate technologies to increase agricultural productivity as well as appropriate manufacturing technologies.

Step 3: Defining Recommendations

Finally, have students return to their groups to recommend ideas, activities, programs, policies, etc. for reaching their sustainable development goals. Suggest that their *recommendations* can be (1) those

that could be instituted at the national level and (2) those that would need to be instituted at the international level. Have groups record these recommendations on **Handout 8.**

When the class reconvenes for discussion, compare recommendations among the groups. What are the greatest differences among the groups? Are there any similarities? To what extent can a country "solve" its own problems? How would the recommended policies of one country affect other countries? Find out if there are conflicting national recommendations. How would they resolve these issues? How would they get international recommendations accepted?

Some international issues confronting the United Nations Conference on Environment and Development include:

- *Biodiversity.* Some poor countries that are rich in biodiversity want to share in the profits of pharmaceutical companies that use their genetic diversity to develop medicines and cosmetics. Some of the big companies don't want to pay for something they get now for free.
- *Energy/Climate Change.* As poor countries grow in population and GNP, they will use more energy and contribute more carbon dioxide to the atmosphere. Should rich countries contribute money and technology to help poor countries become more energy efficient as one way of minimizing global warming?
- *Tropical Forests.* Should rich countries have the right to tell poor countries that they can't clear their forests for agriculture (as the rich countries did) because tropical forests are a "global treasure-house" of biodiversity and the "lungs of the Earth"?

Concluding the Lesson

Sustainable development will require fundamental changes in policies and practices, both for nations and for their citizens. The lives of everyone will be affected. For the United States and Canada, progress toward sustainable development will involve reducing wasteful levels of consumption of energy—for example, by motor vehicles.

Read students the following information: Cars in the United States averaged 21 miles per gallon (mpg) compared with 26 mpg in Europe in 1990. U.S. residents travel more than twice as far by car each year as Europeans and almost four times as far as Japanese.

Can students suggest any reasons why U.S. cars are less energy-efficient? (Currently, gasoline prices are extraordinarily low compared to other industrialized countries.) Why do Americans use automobiles so much more than Europeans? Is it because the United States is a much bigger country geographically?

Show a transparency made from **Overhead Transparency Master 10, "U.S. Motor Vehicle Trips by Purpose and Length, 1983–84."** This reveals that most auto trips taken by U.S. residents are within a short distance of home. What are some of the reasons for this? (Lack of public transportation, lower energy prices, growth of suburbs.) Ask students about their driving habits and those of their families. Do the figures on the graph seem to correspond with their own driving patterns and those of their families and neighbors?

How willing would students be to cut down on their own driving? What alternatives do they have? Suppose the price of gasoline went up significantly. Would this motivate them to cut down on driving? Show **Overhead Transparency Master 11, Comparison of Gasoline Prices and Motor Vehicle Use**. Is energy efficiency an important factor to them in buying a car? How willing are they to support state and national policies (such as higher gas taxes) that might cost them money and inconvenience? (See **Activity 2, "Take a Poll."**) Another way to consider lifestyle changes is to use **Activity 6, "Analyze Eating Habits."**

Suggestions for Further Reading

- *Agenda 21: The Earth Summit Strategy To Save Our Planet*, Daniel Sitarz ed. (Earthpress, Boulder, Colorado, 1993).
- L. Brown, C. Flavin, and S. Postel, *Saving the Planet: How to Shape an Environmentally Sustainable Global Economy* (W.W. Norton, New York, 1991).
- J. Fisher, *The Road From Rio: Sustainable Development and the Nongovernmental Movement in the Third World* (Praeger, Westport, Connecticut, 1993).
- Michael McCoy and Patrick McCully, *The Road from Rio: An NGO Action Guide to Environment and Development* (International Books, Utrecht, The Netherlands, 1993).
- D. Pearce and J. Warford, *World Without End: Economics, Environment, and Sustainable Development* (Oxford University Press, New York, 1993).
- The World Commission on Environment and Development, *Our Common Future* (Oxford University Press, New York, 1987).

1 Develop a Case Study

Have individual students or teams of students research a country and present findings in a case study similar to those of the United States, Thailand, and Tanzania in this lesson. Useful references for this activity include: *World Resources 1994-95* (World Resources Institute, Washington, D.C., 1994); *The 1994 Information Please Environmental Almanac*, compiled by the World Resources Institute (Houghton Mifflin Co., Boston, 1991); *1994 World Population Data Sheet* (Population Reference Bureau, Washington, D.C., 1994); *Social Indicators of Development, 1994* (The World Bank, Washington, D.C., 1994, also available on diskette).

Students could compare and contrast the country they have researched with the three countries studied in this lesson and with countries researched by other students, identifying possible steps toward sustainable development.

Skills emphasis:* *Geo I 1, IV 9, IV 11–12, V 14–16; Math X 1; Science III 4, VII 1–6*

Suggested for use in: *Social Studies, Geography, Environmental Issues.*

2 Take a Poll

In an August 1991 *Wall Street Journal/NBC News* nationwide poll, 8 out of 10 U.S. residents considered themselves to be "environmentalists." Fifty-three percent of those polled said fundamental changes in lifestyle are needed to make dramatic changes in the environment. [Rose Gutfeld, "Eight of 10 Americans Are Environmentalists, At Least So They Say," *Wall Street Journal* (August 2, 1991), p. 1.]

Have students construct a questionnaire dealing with lifestyle change. Questions could focus on both opinions and behaviors (e.g., Opinion: Do you think using less energy is good for the environment? Behavior: Have you changed your driving habits in order to save gasoline?). Students should decide whom they want to poll, administer the questionnaire, tabulate the data in graphs, and analyze the results. Do they find any differences, as the *Wall Street Journal* poll found, between what people say they believe and what they actually do?

It would be interesting to save results of this activity and repeat it in subsequent years, comparing data to see if there are changes over a period of time in attitudes and behavior.

Skills emphasis: *Math I 1–2, X 1, X 4–5; Science I 2, III 4, VI 1, VII 2–4, VII 6*

Suggested for use in: *Social Studies, Geography, Environmental Issues.*

3 Study Alternative Methods of Agriculture

Alternative farming systems are discussed on pp. 101–102 of *World Resources 1992-93*. Have students study some alternative methods of farming, such as the Amish, who follow traditional methods and shun fossil-fuel-powered machinery and electricity. One source is Gene Logsdon, "Amish Economics," in *Green Business: Hope or Hoax?; Toward an Authentic Strategy for Restoring the Earth*, Christopher Plant and Judith Plant, eds. (New Society Publishers, Philadelphia, 1991). If farmers in your area are using alternative farming methods, have students visit those farms to observe and report back to the class. What are some of the advantages and disadvantages of alternative farming, compared with conventional agricultural practices?

Skills emphasis: *Geo V 14–16; Hist IV 1; Science III 1, III 3–4, III 6, VI 4, VII 2–5*

Suggested for use in: *Biology, Earth Science, Geography, Environmental Issues.*

4 Manage a Fishing Company

Fish Banks, Ltd. is a computer-assisted simulation that teaches principles for the sustainable management of renewable resources—in this case, fish. The game is suitable for use by groups of any size between 8 and 40 players and requires about three hours, with minimal setup time. Players are divided into teams, each of which operates its own fishing company in a common ocean. The interactions in the game provide a framework for understanding the behavior of fisheries and other renewable resources. The game also provides a metaphor for discussing solutions to the problem of resource depletion. Dennis L. Meadows and Thomas S. Fiddaman of the University of New Hampshire, developers of the simulation, state that because players "have directly experienced the collapse of a resource, entirely due to their own behavior, the players feel a greater sense of responsibility for finding solutions to the real-world problems." Fish Banks, Ltd. is available for Apple Macintosh or IBM computers for US$100. Contact Prof. Dennis Meadows, Director, Institute for Policy and Social Science Research, Hood House, University of New Hampshire, Durham, NH 03824.

Skills emphasis: *Geo I 1, I 3, III 8, IV 1, IV 11, IV 12–13, V 14–16, V 18; Civics IV 1–3; Math I 1–2, I 4, XI 1–2; Science III 1, III 4, III 7, V 3, VI 1–4, VII 1–3, VII 6*

Suggested for use in: *Environmental Issues, Ecology, Biology, Social Studies, Geography.*

See chart of Draft National Performance Standards at beginning of this unit.

5 Resources for Living Lightly

Obtain a large map of your community. Such maps are often available from the local planning office or from a local real estate agent. Have students do research to find the places in your community where items can be recycled or reused, and locate these places on the map. Places to include are recycling centers, second-hand stores, used-book stores, used-record stores, and flea markets. Students will need a current business phone directory and other resources that can be found in a library, such as listings of local businesses. Students could visit places to obtain information for buyers and for those who want to sell or donate items. Findings could be compiled in a brochure. Students might like to put on a demonstration: a fashion show of bargains they have found, a "how-to-recycle-unusual-items" skit, etc. to encourage other students to recycle and reuse items instead of throwing them away.

Skills emphasis: *Geo I 1, IV 12; Science III 4, VII 2–3*

Suggested for use in: *Social Studies, Home Economics, Geography.*

6 Analyze Eating Habits

To help students see a connection between their eating habits and the environment, have them keep a record of what they eat for a week. How much meat and other animal products (milk, cheese, eggs) do they eat? Then have students do some reading about the links between the North American meat-based diet and the world's environment. Two sources are John Robbins, *Diet for a New America* (Stillpoint Press, Walpole, New Hampshire, 1987) and Frances Moore Lappe, *Diet for a Small Planet* (Ballantine Books, New York, 1982).

If some of your students are vegetarians, ask them to share their reasons for choosing this diet, if they feel comfortable doing so. Ask them to suggest ways of substituting vegetarian meals and dishes, or have the class explore various ways to change their eating habits: having a vegetarian main course for one meal a week (meatless pizza, for example), or eating less meat. Create a display of cookbooks, prepare a variety of vegetarian dishes, and have a tasting session, awarding prizes to the students' favorite dishes.

Skills emphasis: *Science III 4, VI 1, VII 2–5*

Suggested for use in: *Social Studies, Home Economics.*

7 Investigate Environmental Careers

Encourage students to think of the many different careers that might be open to them, not just scientific careers but many other fields—for example, environmental law. Perhaps you could invite speakers to talk to students about their environmental career, or have students "shadow" someone who has a job related to the environment. Students could then report back on how jobs are related to issues of sustainable development. A useful reference is *The New Complete Guide to Environmental Careers* (Island Press, 1993).

Skills emphasis: *Science VII 2–3, VII 5*

Suggested for use in: *Social Studies, Biology, Chemistry, Earth Science, Ecology.*

Audiovisual Resources

- *Greenbucks: The Challenge of Sustainable Development*, 55 min., VHS, Gabrielle Kelly and Nick Hart-Williams, The Video Project. Greenbucks *looks at the first positive steps major corporations on five continents are taking to change their ways and protect the environment.*
- *Growing Up in the World Next Door*, 59 min., VHS and 16mm, Asterisk Productions, Bullfrog Films. *The film chronicles the changes for three teenagers growing up in the developing world after their lives are touched by international development projects.*
- *Race to Save the Planet* (1990), 10-part series, 60 min. each, VHS. Contact PRB or Annenberg/CPB Project at (800)LEARNER, Box 1922, Santa Barbara, CA 93116-1922. *Ten one-hour programs on environmental science, exploring the effect of human activity on the environment. Premiered on PBS during the fall of 1990.* Program titles: *The Environmental Revolution, Do You Really Want to Live this Way?, Remnants of Eden, Save the Earth—Feed the World, It Needs Political Decisions, Only One Atmosphere, In the Name of Progress, More for Less, Waste Not Want Not, Now or Never.*
- *Sowing for Need or Sowing for Greed?* 56 min., VHS, Bourque & Gunnarson, Bullfrog Films. *The Green Revolution had mixed results in developing countries. Now the "gene revolution" in biotechnology could bring new hope or false promise.*

Facts about Global Warming and Ozone Depletion

The Earth's atmosphere, a thin blanket of gases, protects the planet from the harshest of the sun's ultraviolet radiation. The atmosphere, by trapping the Earth's warmth, keeps rivers and oceans from freezing. Carbon dioxide and water vapor are the most important gases in creating the insulating or "greenhouse effect" of the atmosphere.

The amount of carbon dioxide in the atmosphere has been increasing rapidly. Human activities are also releasing other "greenhouse" gases such as methane, ozone, and chlorofluorocarbons (CFCs), which intensify the heat-trapping properties of the atmosphere as a whole. CFCs also rise into the upper layer of the atmosphere, the stratosphere, where they destroy the protective layer of ozone, a gas that forms a shield against ultraviolet rays that can harm many forms of life.

About 1 million tons (over 900,000 metric tons) per year of CFCs have been released worldwide since the mid-1970s. In the lower atmosphere, CFCs contribute to global warming, but in the stratosphere, they trap ozone molecules, degrading the protective shield. In 1991, scientists concluded that decreased stratospheric ozone has a cooling effect on the lower atmosphere that may be large enough to actually offset part of the warming from greenhouse gases. If the warming effect of CFCs is offset by the newly discovered cooling effect, then phasing out CFC use will not decrease global warming. However, a phaseout will still protect the stratospheric ozone layer.

Concern is growing that atmospheric changes could bring on rapid, profound climatic changes.

Sources and Types of the Most Important Greenhouse Gases

Carbon Dioxide (CO_2): released by the burning of fossil fuel (oil, coal, and natural gas), flaring of natural gas, changes in land use (deforestation, burning and clearing land for agricultural purposes), and the manufacturing of cement. Accounts for one half of the warming potential caused by human activity.

Methane (CH_4): sources include landfills, wetlands and bogs, domestic livestock, coal mining, wet rice growing, natural gas pipeline leaks, biomass burning, and termites. Molecule for molecule, methane traps heat 20–30 times more efficiently than CO_2. Within 50 years, it could become the most significant greenhouse gas.

Chlorofluorocarbons (CFCs): industrial products developed 60 years ago. Used in refrigerators, automobile air conditioners, solvents, aerosol propellants, insulation. The most powerful of the greenhouse gases—in the atmosphere, one molecule of CFC has about 20,000 times the heat-trapping power of a molecule of carbon dioxide. In the upper atmosphere or stratosphere, CFCs degrade the ozone layer. One CFC molecule can trap as many as 100,000 ozone molecules. The thinning of the ozone layer may have a cooling effect on the lower atmosphere. It also allows penetration of more ultraviolet rays, which can cause skin cancers and cataracts in humans as well as damage plants.

Nitrous Oxide (N_2O): sources include burning of coal and wood, and soil microbes' digestion. Long-lasting gas that eventually reaches the stratosphere where it helps destroy the ozone layer.

Ozone (O_3): an unstable form of oxygen. Produced by photochemical processes in the atmosphere when nitrogen oxides react with organic compounds. In the lower atmosphere, ozone is a greenhouse gas. (In the upper atmosphere, ozone absorbs much of the sun's damaging ultraviolet rays.)

Trends

Atmospheric concentrations of greenhouse gases are rising at unprecedented rates. Greenhouse gas emissions from developing countries are expected to increase rapidly.

Large-scale climate changes may occur unless other climatic systems counteract the warming effect of the greenhouse gases.

The eruption of the Mt. Pinatubo volcano in the Philippines in June 1991 sent a huge volume of ash and sulfur dioxide (SO_2) into the stratosphere that could temporarily change the Earth's climate. In a single eruption, the volcano emitted almost 20 million tons (18,144,000 metric tons) of SO_2—nearly as much as the entire SO_2 emissions of the United States in one year. Sulfur dioxide creates a haze of sulfuric acid that reflects and scatters sunlight. Experts think this haze might lower average global temperatures by more than 0.3° F (0.2° C) for three or four years, enough to mask global warming.

Facts about Global Warming and Air Pollution *(continued)*

Total global energy use is projected to grow at an annual rate of 1.5–2 percent. Nonfossil energy sources are likely to become more important because of concern over global warming.

Cleaner, more efficient energy technologies can significantly reduce greenhouse gases from fossil fuels, especially over the next 20 years. However, total greenhouse gas emissions are likely to increase due to expanded energy use.

Demand for refrigeration (which has cooling systems that use CFCs) in developing countries is projected to increase greatly, especially in China and India.

Ozone losses in the upper atmosphere are occurring at all latitudes in both hemispheres. The most striking example of ozone loss occurs over the South Pole during September and October. As ozone is lost, the amount of biologically harmful ultraviolet-B (UV-B) radiation will increase. Skin cancer rates are expected to increase. Other health effects will likely include an increase in cataracts and suppression of the immune system. Increased UV-B radiation may also harm plants.

The international community is taking steps to control and ultimately ban production of CFCs by the year 2000. By July 1991, about 70 nations (including Canada and the United States) had signed the Montreal Protocol on Substances That Deplete the Ozone Layer (1987). These nations represent over 90 percent of global CFC production and consumption.

Some developing countries are quickly phasing out CFC use. Others refuse to sign this treaty because they fear switching to ozone-friendly technology will be too expensive and hamper their development. A fund, financed by the largest CFC users, has been set up to compensate developing countries for the added costs of doing without CFCs.

Talking About Energy, Atmosphere, and Climate Change

British thermal unit (Btu)—unit of heat equal to about 252 calories; the quantity of heat required to raise the temperature of one pound (about 1 pint or 0.5 kilograms) of water one degree Fahrenheit (0.6° C). One Btu equals 1,055 joules or about 1 kilojoule.

commercial fuels—fuels used commercially include the fossil fuels: oil, coal, and natural gas; nuclear energy; and hydro, wind, and geothermal power.

energy intensity—the amount of energy needed to produce one dollar (U.S.) of gross domestic product.

exajoule—1 quintillion (1,000,000,000,000,000,000) joules.

gigajoule—1 billion (1,000,000,000) joules.

gross domestic product—the sum of the final outputs of the various sectors of the economy (agriculture, manufacturing, government services, etc.) after subtracting inputs to production. Gross domestic product includes only domestic production. Gross national product includes overseas production.

joule—0.0009478 Btus. The basic metric unit of energy measurement.

kilojoule—1,000 joules.

megajoule—1 million (1,000,000) joules.

petajoule—1 quadrillion (1,000,000,000,000,000) joules.

primary electricity—a way of measuring hydro, geothermal, wind, and nuclear electrical power generation in terms of how much fossil fuel it would take to produce the same amount of electricity.

renewable fuel—fuels that are not used up, such as solar, wind, and hydropower, and fuels that can be regrown, such as biomass.

terajoule—1 trillion (1,000,000,000,000) joules.

traditional fuel—includes wood, charcoal, and animal and vegetable waste. Because it is difficult to monitor, traditional fuel use is not included in most assessments of national, regional, or global energy use.

National and International Efforts Toward Sustainable Development

The 1992 United Nations Conference on Environment and Development (UNCED, popularly known as the Earth Summit) resulted in several major agreements designed to lead the world towards sustainable development, among them international conventions on climate and biodiversity, and *Agenda 21*, a plan for national and international cooperation for sustainable development and environmental protection. *Agenda 21* contains recommendations for governments to develop their own national strategies for sustainable development, for community-based efforts toward sustainable development, and for exchanging environmental technologies. Several current efforts are outgrowths of the discussions and agreements that occurred as a result of the Earth Summit.

Inspired by the Earth Summit, several national and international organizations have formed to work towards sustainable development. The major groups are listed below.

United Nations Commission on Sustainable Development

The United Nations Commission on Sustainable Development was established after the June 1992 Earth Summit to monitor and foster the implementation of *Agenda 21*. The 53-member commission was set up by the United Nations General Assembly and is chaired by Malaysia's UN Ambassador Razali Ismail. The Commission is composed of members from government, academia, and the scientific and NGO communities around the world.

At its first meeting in June 1993, the Commission decided on a multi-year thematic approach to dealing with subjects such as poverty, education, and financial resources. Special working groups are to be set up in finance and technology transfer. The Commission also plans to review voluntary annual national reports submitted by governments as part of *Agenda 21* and provide policy recommendations.

For more information, write to: United Nations Commission on Sustainable Development, Room S-3060A, United Nations Plaza, New York, NY, 10017.

Earth Council

The Earth Council is a nongovernmental organization founded in 1992 by Maurice Strong, Secretary General of the Earth Summit. Chaired by Mr. Strong, the Council consists of 21 members from different regions of the world and is headquartered in San Jose, Costa Rica. The selection of council members and programs was based on discussions conducted by the Earth Council Organizing Committee with over 10,000 organizations from around the world. The Earth Council's mission is to:

- promote greater public awareness and discussion of environment and development issues,
- encourage interaction among all groups of society (including local communities, youth, indigenouspeoples, the private sector) and encourage sustainable and equitable patterns of resource consumption,
- support international efforts to implement the agreements of the Earth Summit,
- support and review the work of the UN Commission on Sustainable Development, and
- help concerned groups gain access to environment and development networks.

For more information, write to Earth Council, P.O. Box 2323-1002, San Jose, Costa Rica.

Canadian National Round Table on the Environment and the Economy

In 1989, the Prime Minister of Canada established the National Round Table on the Environment and the Economy, comprised of representatives from government, industry, science, education, nongovernmental organizations, and native peoples, to advise him on policies for sustainable development and to develop strategies for action. Provinces and territories also formed Round Tables and, in many cities, municipal Round Tables were formed.

Available free from the Canadian National Round Table is the book *Building Consensus for a Sustainable Future* and the newsletter *National Round Table Review*.

Write to: Canadian National Round Table on the Environment and the Economy, 1 Nicholas Street, Suite 1500, Ottawa, Ontario, Canada K1N 7B7.

A spinoff of the Canadian Round Tables is the sustainable development education program, Learning for a Sustainable Future, which, with provincial round

National and International Efforts Toward Sustainable Development *(continued)*

tables, has published the *Framework for Sustainable Development Education* for Canada.

Write to: Learning for a Sustainable Future, 45 Rideau Street, Suite 303, Ottawa, Ontario, Canada K1N 5W8

U.S. President's Council on Sustainable Development

The U.S. President's Council on Sustainable Development was established in June 1993 to explore and develop policies that encourage economic development, job creation, and protection of natural resources. The 25 members of the council represent industry, government, environment, labor, and civil rights organizations. They plan to meet quarterly over a two-year term, which can be extended another two years.

The council is forming several task forces including Principles, Goals and Definitions; Sustainable Communities; Eco-Efficiency; Energy; Natural Resources; Public Linkage; Population and Consumption; Climate Change; and Sustainable Agriculture.

The President's Council plans to develop a national sustainable development action strategy that will foster long-term economic vitality, natural resource protection, pollution prevention, and cultural preservation. It will also create an annual Presidential Award for efforts toward advancing sustainable development ideals and will help the President conduct a public awareness campaign on the need for sustainable development.

For an information packet, write to: President's Council on Sustainable Development, Mailstop 7456, 1849 C Street, NW, Washington, D.C. 20240.

U.S. Citizens Network on Sustainable Development

Organized to help shape global policy on environment and development, the U.S. Citizens Network on Sustainable Development is a grassroots organization that promotes activities to build public understanding of sustainable development, collects and disseminates information, and works with citizen's groups in other countries to influence their governments.

The Citizen's Network is primarily composed of nongovernmental organizations that developed as a response to the Earth Summit. Over 500 organizations participated at the height of the Earth Summit. Working groups are organized by issue and meetings take place mainly in the form of conference calls. However, some meetings are arranged during other conferences.

The Citizen's Network offers a monthly newsletter as well as two publications, *Road From Rio*, a nongovernmental organization action guide and *Guide to UNCED*.

For more information, write to: U.S. Citizen's Network on Sustainable Development, 73 Spring Street, #402, New York, NY 10012

The Centre for Our Common Future

The Centre for Our Common Future, a Swiss charitable foundation founded in April 1988, acts as a nonpartisan information clearinghouse on sustainable development activities. It works in cooperation with the Earth Council to coordinate public participation efforts. It assists groups in developing countries to improve their access to information and organizes meetings on sustainable development issues.

The Centre organized the popular Global Forum at the Earth Summit at which thousands of nongovernmental organizations from around the world gathered to discuss and celebrate sustainability. It also plans to sponsor an international follow-up conference in Manchester, England in June 1994—the second anniversary of the Earth Summit.

The Centre principally works with its "Working Partners," 200 organizations and institutions in over 70 countries that help distribute the Centre's information. In turn, the Working Partners provide the Centre with financial support and news about progress in their regions. The Centre publishes books, two newsletters, and video tapes on sustainable development issues.

For more information, write to: Centre for Our Common Future, 52, rue des Paquis, 1201 Geneva, Switzerland.

Copies or press summaries of the major Earth Summit documents can be obtained free from the United National Information Program on Sustainable Development, Room S-1037, United Nations, New York, NY 10017. Fax: (212) 963-4556. There is a small charge for quantity orders. Documents available include:

Agenda 21 Press Summary—DPI/1298

The Rio Declaration/Declaration of Forest Principles—DPI/1299

Convention on Biological Diversity—DPI/1307

Convention on Climate Change—DPI/1300

An easy-to-read overview of the *Convention on Biological Diversity* is available from, Biodiversity Action Network, 424 C Street, NE, Washington, D.C. 20002.

Defining Sustainable Development

The World Commission on Environment and Development defined sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs." (*Our Common Future*, Oxford University Press, New York, 1987.) The concept of sustainable development is new and controversial, and the policies needed to put it into practice are still developing. No country is yet pursuing a policy of sustainable development.

The road to sustainable development is not the same for an industrialized country, a rapidly industrializing country, and a developing country. Some steps are appropriate for all countries; others are more appropriate for countries at specific stages of development.

Sustainable development can be thought of as a process requiring simultaneous progress in four dimensions: economic, human, environmental, and technological. The sustainable development goals listed below are divided among these categories. There are close linkages among these different dimensions and actions in one area can reinforce goals in another. For example, if further economic development is to be sustainable, it cannot neglect environmental constraints or be based on the destruction of natural resources; it cannot succeed without the parallel development of human resources; it will require transformation of the existing industrial base and the development and diffusion of more Earth-friendly technologies.

Economic Dimensions

- Steadily reducing wasteful levels of consumption of energy and other natural resources through improvements in efficiency and through changes in lifestyle.
- Changing consumption patterns that needlessly threaten the biodiversity of other countries.
- Providing leadership to support sustainable development in other countries.
- Reducing import barriers or protectionist pricing policies that limit the access that poor economies have to markets for their products.
- Using financial, technical, and human resources to develop cleaner, less resource-intensive technologies.
- Giving more equal access to resources to all people.
- Reducing growing disparity of incomes and access to health care.
- Transferring money from military and state security expenditures to development needs.
- Committing resources toward continued improvement in living standards.
- Alleviating absolute poverty.
- Improving access to land, education, and social services.
- Developing an efficient manufacturing sector to employ workers and produce goods for trade and consumption.

Human Dimensions

- Stabilizing population.
- Slowing migration to the cities through rural development.

Defining Sustainable Development *(continued)*

- Adopting policy measures and technologies to minimize environmental consequences of urbanization.
- Improving standards for literacy.
- Making primary health care more accessible.
- Improving social well-being, protecting cultural diversity, and investing in human capital.
- Investing in the health and education of women.
- Encouraging participation in decisionmaking.

Environmental Dimensions

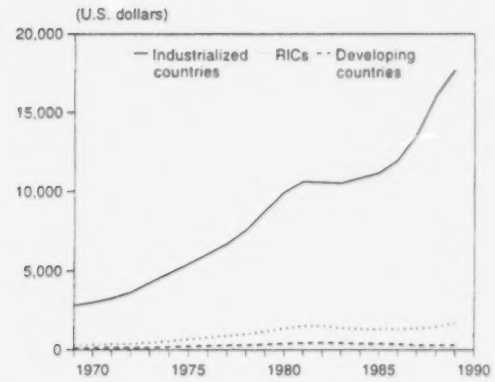
- More efficient use of arable lands and water supplies.
- Improving agricultural practices and technologies to increase yields.
- Avoiding overuse of chemical fertilizers and pesticides.
- Conserving water by ending wasteful uses and improving efficiency of water systems.
- Improving water quality and limiting surface water withdrawals.
- Conserving biodiversity by greatly slowing and, if possible, halting extinctions and habitat and ecosystem destruction.
- Preventing destabilization of climate or destruction of the ozone layer by human actions.
- Protecting natural resources needed for food production and cooking fuels while expanding production to meet the needs of growing populations.
- Using irrigation carefully.
- Avoiding expansion of agriculture on steep hillsides or marginal lands.
- Slowing or halting destruction of tropical forests, coral reef ecosystems, coastal mangrove forests and other wetlands, and other unique habitats to conserve biological diversity.

Technological Dimensions

- Shifting to technologies that are cleaner and more efficient, that minimize consumption of energy and other natural resources, and do not pollute air, water, and land.
- Reducing carbon emissions to limit the global rate of increase of greenhouse gases and eventually stabilize the atmospheric concentrations of these gases.
- Over time, greatly curtailing use of fossil fuels, and finding other sources of energy.
- Phasing out use of CFCs to prevent degradation of the Earth's protective ozone layer.
- Preserving traditional technologies that create few wastes or pollutants, that recycle wastes, and work with or support natural systems.
- Rapidly adopting improved technologies as well as improved government regulation and enforcement.

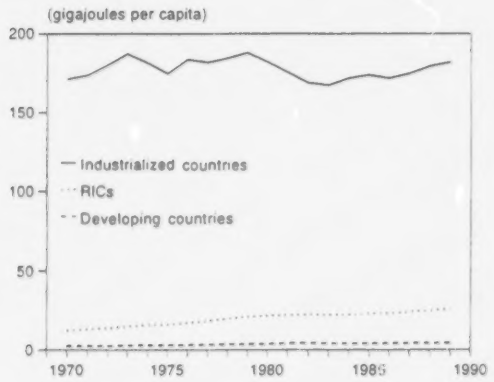
Indicators of Sustainable Development

a. Trends in Gross National Product Per Capita, 1969–89



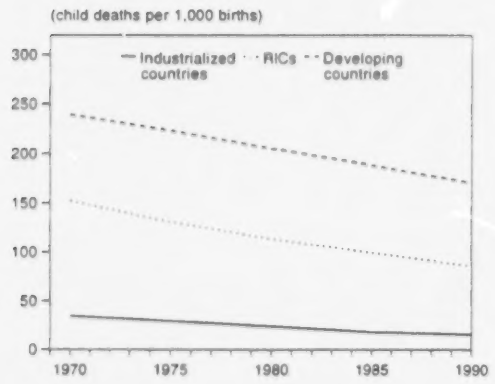
Source: The World Bank, unpublished data (The World Bank, Washington, D.C., 1991).
Note: The gross national product (GNP) is the sum of personal consumption expenditure on goods and services plus government expenditure on goods and services plus investment expenditures. To calculate GNP per capita, this sum is divided by the number of people in the country. Data for industrialized countries do not include Central Europe and the former Soviet Union; data for developing countries do not include India and China. Data have not been included for newly industrialized countries such as Hong Kong, Singapore, South Korea, and Taiwan.

b. Trends in Energy Consumption Per Capita, 1970–89



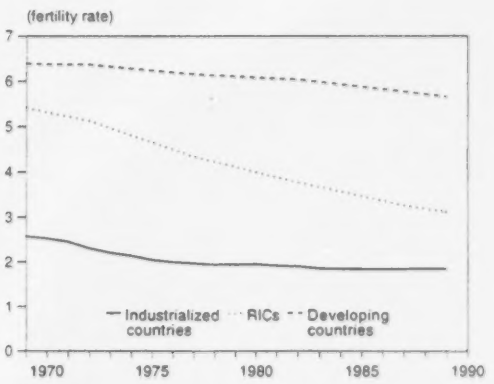
Source: United Nations (U.N.), *Energy Statistics Yearbook, 1989* (U.N., New York, 1989) and previous volumes.
Note: A country's total commercial energy consumption includes energy from solid, liquid, and gaseous fuels plus primary electricity. Traditional energy sources such as fuelwood and charcoal are not included. To calculate the energy consumption per capita, the total is divided by the number of people in the country. Data for industrialized countries do not include Central Europe and the former Soviet Union; data for developing countries do not include India and China. Data have not been included for newly industrialized countries such as Hong Kong, Singapore, South Korea, and Taiwan.

c. Trends in Under-Five Mortality, 1970–90



Source: The World Bank, unpublished data (The World Bank, Washington, D.C., 1991).
Note: The under-five mortality rate is obtained by dividing the number of children under 5 years of age who die in a given year by the number of live births in that year and multiplying by 1,000. Data for 1990 are projected. Data for industrialized countries do not include Central Europe and the former Soviet Union; data for developing countries do not include India and China. Data have not been included for newly industrialized countries such as Hong Kong, Singapore, South Korea, and Taiwan.

d. Trends in Fertility, 1969–89



Source: The World Bank, unpublished data (The World Bank, Washington, D.C., 1991).
Note: The total fertility rate is an estimate of the number of children that an average woman would have if current age-specific fertility rates remained constant during her reproductive years. Data for industrialized countries do not include Central Europe and the former Soviet Union; data for developing countries do not include India and China. Data have not been included for newly industrialized countries such as Hong Kong, Singapore, South Korea, and Taiwan.

Case Study: United States

With a gross national product (GNP) of nearly US$5.3 trillion and a GNP per capita of more than US$21,000, the United States ranks as the wealthiest country in the world. Service industries—such as health care, banking, entertainment, transportation—account for about 69 percent of this wealth, manufacturing for about 29 percent.

This vast wealth still has not reached a significant and growing number of U.S. residents. The number of U.S. residents with incomes less than half the national median income increased during the 1980s. Absolute poverty also increased: the average income of the bottom 20 percent of U.S. families declined from US$10,176 in 1970 to US$9,833 in 1990.

Other measures suggest that the United States has lagged behind other industrialized countries in investing in human welfare. Mortality of children under five years of age now stands at about 10; that is about half the level that prevailed two decades ago, yet it is still higher than the level prevailing in many European countries and Japan.

Agriculture provides just 2 percent of GNP but is extremely productive; the United States is the world's largest producer of grains and maintains the third largest herd of cattle. But intensive farm practices in the United States, including heavy doses of fertilizers and pesticides, have had important environmental impacts. Massive amounts of soil and fertilizers erode from American farms and into rivers; in fact, more than half the suspended sediment and nutrient pollution in freshwater is from farms.

The country has abundant mineral resources and produces 15 percent of the world's oil, 20 percent of the coal, and 25 percent of the natural gas. It is a major producer of iron, steel, copper, cadmium, and lead.

U.S. residents also have an enormous appetite for resources. They are the world's largest consumers of energy and the largest or second largest consumers of nine metals. They are among the world's leaders in energy use per capita and rank second in the world in water use per capita.

Though still heavy users of energy, the United States also has managed to use its energy much more efficiently than in the past. From 1973 to 1988, the United States built 20 million new homes, put 50 million more vehicles on its roads, and increased its GNP by 46 percent; yet energy consumption increased only 7 percent. There is still much room for improvement, however; cars, appliances, and commercial buildings in the United States use 20–33 percent more energy than in most other industrial countries. The U.S. auto fleet uses considerably more fuel than most European fleets, primarily because the average price of gasoline is extraordinarily low by industrial world standards. U.S. residents travel more than twice as far by car each year as Europeans, partly because of the larger size of the country but mostly because of inadequate public transportation systems, lower energy prices, and the urban sprawl of the past 40 years.

Air and water pollution have been serious problems in the United States, but clean air and clean water laws passed in the last few decades have led to improvements in some areas. Air quality is generally improving, though many urban areas do not meet national standards for smog. Sulfur emissions from utilities and other sources also contribute substantially to the acid rain that falls primarily on the northeastern United States and southeastern Canada.

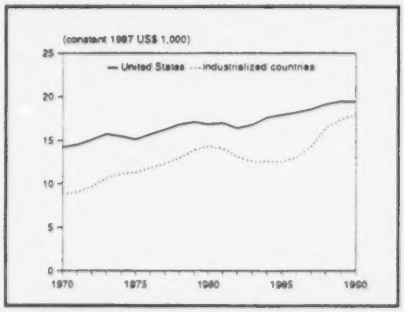
The United States is the largest single emitter of greenhouse gases, primarily carbon dioxide; more than 20 percent of the carbon dioxide released from burning fossil fuels worldwide comes from the United States. The United States also has been a significant contributor of ozone-depleting chlorofluorocarbons, but has pledged to switch to substitutes by the end of 1995.

Sources:

1. World Resources Institute in collaboration with the United Nations Environment Programme and the United Nations Development Programme, *World Resources 1992-93* (Oxford University Press, New York, 1992).
2. *The 1992 Information Please Environmental Almanac*, compiled by the World Resources Institute (Houghton Mifflin Co., Boston, 1991).

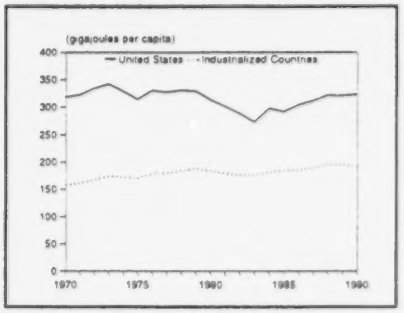
Note: The scales on Figures 1, 2, and 3 below are different than comparable figures in the other two case studies.

Figure 1 Gross National Product Per Capita
(constant 1987 US$1,000)



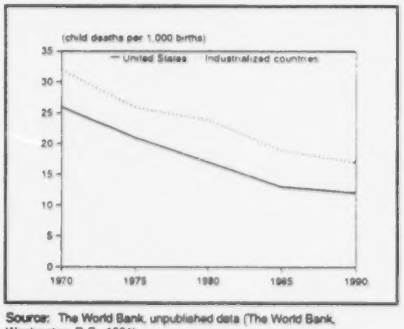
Source: The World Bank, "The World Tables, 1993" on Diskette (The World Bank, Washington, D.C., 1993); United Nations Population Division (UNPD), "Interpolated National Populations (The 1992 Revision)" on diskette (UNPD, New York, 1992).

Figure 2 Energy Consumption Per Capita
(gigajoules per capita)



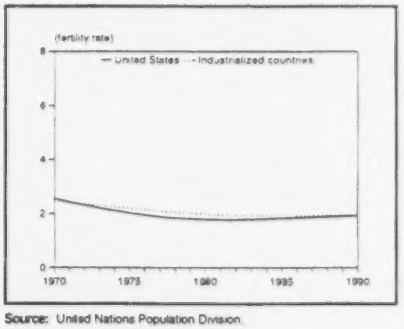
Source: United Nations Statistical Division (UNSTAT), "UN Energy Tape," on diskette (UNSTAT, New York, 1993); United Nations Population Division (UNPD), "Interpolated National Populations (The 1992 Revision)," on diskette (UNPD, New York, 1992).

Figure 3 Mortality of Children Under Age 5
(child deaths per 1,000 births)



Source: The World Bank, unpublished data (The World Bank, Washington, D.C., 1991).

Figure 4 Total Fertility Rate
(fertility rate)



Source: United Nations Population Division.

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Case Study: Thailand

Thailand built its economic wealth on its abundant natural resources (including teak, fish, rice, and tin) but now gets an increasing share of its gross national product (GNP) from manufacturing and services. Thailand showed a sharp increase in gross national product (GNP) per capita in recent years, pulling ahead of the average developing countries.

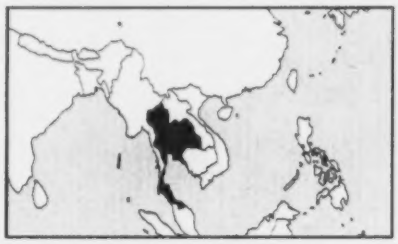
In several cases, Thailand nearly destroyed the resource base that fueled its growth. Logging reduced Thailand forest cover from 55 percent of the country in 1961 to about 28 percent by 1988. Deforestation left large areas of bare soil, contributing to mud slides, floods, and loss of life. As a result of the disastrous floods, Thailand banned logging as of January 1989. The Thai fishing fleet, which brings in the world's third largest catch, has decimated fish populations in the Gulf of Thailand and can maintain its catch only by building larger vessels that go further offshore. The rapid expansion of brackish water prawn culture on the southeast coast has led to the widespread destruction of mangrove forests.

The natural beauty of Thailand's coastline helps make tourism Thailand's leading source of foreign exchange. Although tourism may provide an incentive to protect scenic areas, it also causes pollution in resort towns such as Pattaya.

Thailand is more ethnically homogeneous than the other Asian rapidly industrializing countries (RICs), Malaysia and Indonesia. All but 5 percent of the population is made up of Thai-speaking Buddhists. Since the 1930s, the country has mostly been ruled by a succession of military governments; in 1988, Thailand elected its first prime minister in 12 years, suggesting that democracy may be maturing.

Thailand has invested heavily in human development. Literacy now stands at 90 percent for women and 96 percent for men, comparable to that of South Korea. Deaths of children under five have dropped from 91 per 1,000 in the 1970–75 period to a projected 39 per 1,000 in 1990–95, far below the Asian average of 94. Assisted by a vigorous family planning program and rising living standards, Thailand has undergone a demographic transition to lower birth rates. The fertility rate dropped from 5.5 in 1970 to less than 3 in 1990, below the average for developing countries.

Thailand has branched into labor-intensive industries such as integrated circuit and electronics assembly, footwear manufacturing, toy making, and textiles. Such industries have attracted considerable investment from Japan and Taiwan. Agriculture, still an important economic sector, employs the largest number of people, 18 million, or perhaps 70 percent of the work force. Northern rural areas are considerably poorer and have fewer services than metropolitan Bangkok (with 8.5 million people). On the other hand, Bangkok is choked by traffic and pollution, has no mass transit,



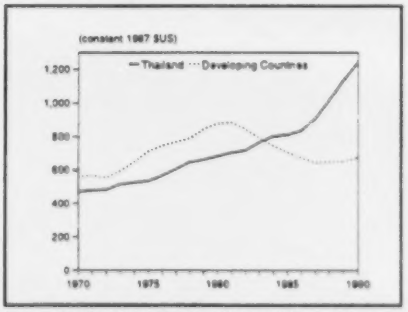
and is home to at least 1 million squatters and slum dwellers.

Energy use, and especially electricity use, is growing rapidly. Per capita energy consumption has increased from about 8 gigajoules in 1970 to 18 in 1990, a point slightly below the 1990 average for developing countries. Thailand has considerable reserves of natural gas, a clean-burning fuel, that could be tapped for both domestic use and export in liquefied form.

Sources:

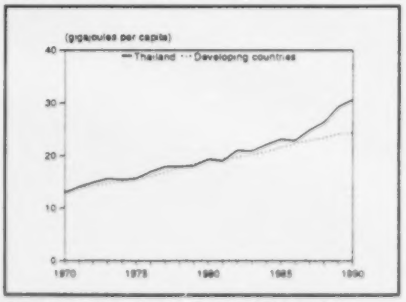
Reprinted from *World Resources 1992-93*, p. 49. Primary sources include:
1. The Economist Intelligence Unit (EIU), *Thailand, Burma Country Profile 1990-91* (EIU, London, 1990), p. 8.
2. Theodore Panayotou and Chartchai Parasuk, *Land and Forest: Projecting Demand and Managing Encroachment* (Thailand Development Research Institute, Ambassador City, Jomtien, Chon Buri, Thailand, 1990), Appendix B, p. 74.
3. The World Bank, *Trends in Developing Economies 1991* (The World Bank, Washington, D.C., 1991), p. 521.

Figure 1 Gross National Product Per Capita
(constant 1987 US$)



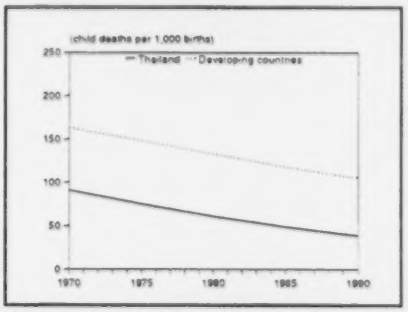
Source: The World Bank, "The World Tables, 1993" on diskette (The World Bank, Washington, D.C., 1993); United Nations Population Division (UNPD), "Interpolated National Populations (The 1992 Revision)" on diskette (UNDP, New York, 1992).

Figure 2 Energy Consumption Per Capita
(gigajoules per capita)



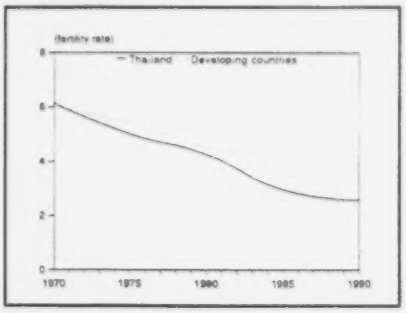
Source: United Nations Statistical Division (UNSAT), "UN Energy Tape," on diskette (UNSTAT, New York, 1993); United Nations Population Division (UNPD), "Interpolated National Populations (The 1992 Revision)," on diskette (UNPD, New York, 1992).

Figure 3 Mortality of Children Under Age 5
(child deaths per 1,000 births)



Source: The World Bank, unpublished data (The World Bank, Washington, D.C., 1991).

Figure 4 Total Fertility Rate
(fertility rate)



Source: United Nations Population Division.

30

Case Study: Tanzania

Tanzania, in southern Africa, with a population of about 27 million, is a poor country but one that has the natural resources to prosper. Tanzania's gross national product (GNP) per capita is a mere US$120, compared to US$1,170 in Thailand and US$21,100 in the United States.

Agriculture, which accounts for more than half the gross domestic product, is a top priority in the nation's development policy. About 90 percent of the work force is involved in agriculture. About 55 percent of the total land surface is potentially agricultural land, but only 5 percent is cultivated because of a lack of investments, a lack of fertilizer, and, in some areas, tsetse flies. Much of the land has a low and erratic rainfall. The leading export crop is coffee; other exports include cashew nuts, tobacco, tea, sisal, and cotton.

Tanzania, which includes the island of Zanzibar, is one of the least urbanized countries in the world. But, the country's growth rate—3.4 percent—is one of the world's highest; problems of overcrowding and inadequate housing, water supplies, sanitation, refuse collection, and transportation are common in Tanzanian cities and towns. Sixty to seventy percent of urban populations live in squatter settlements.

Tanzania has a widely dispersed population, but does not have an adequate transportation system of roads or railways to carry goods to market. In 1989, the World Bank launched a US$750 million program to improve highways.

The government has made enormous strides in health and education programs. Thirty years ago, literacy in Tanzania was 15 percent; by the 1980s, it had reached 92 percent. Primary school enrollment was 72 percent in 1988; secondary school enrollment was 3 percent. Almost half of the population is under age 15.

The fertility rate (about 7.1) is noticeably higher than that of other developing countries (4.0). As mentioned above, the population growth rate is one of the highest in the world. Although Tanzania's infant mortality rate (158 per 1,000 births) is lower now than 30 years ago when it gained independence, it is still one of the highest in the world and considerably above other developing countries.

Tanzania's energy use per capita (14 gigajoules) is far below the United States (324 gigajoules) and even well below other developing countries. However, the country's very high population growth rate means that there will be a growing pressure on natural resources for subsistence and commercial purposes.

There is no comprehensive national environmental legislation or policy for Tanzania, and there are environmental problems in almost every part of the country. Although half of the country's land is suitable for grazing, 60 percent of this is infested with tsetse flies and

thus, is not usable. Animals are concentrated in certain areas, leading to overgrazing, soil erosion, low productivity, and land degradation.

Trees are disappearing as more land is cleared for agricultural purposes. Urban growth has also led to deforestation around cities. And since the population depends almost entirely on wood for fuel, fuelwood gathering is causing serious deforestation.

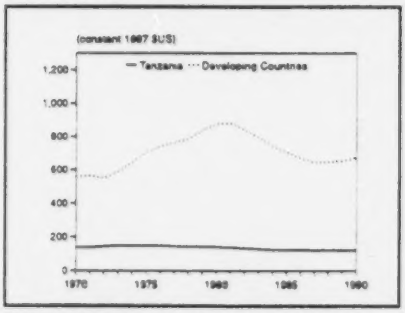
Tanzania has substantial mineral resources in gold and phosphates and may have offshore oil reserves as well. Fishing is an important industry for Tanzania. Coral reefs near the country's narrow coastline are highly desirable areas for fishing as well as for tourism, but the use of dynamite by fishermen has damaged much of them.

Tanzania's wildlife resources include 11 national parks, 18 game preserves, and 48 controlled hunting areas. Building up the country's tourist industry could be a huge boost to the economy, but without a strong environmental policy, this could have devastating long-term effects.

Sources:

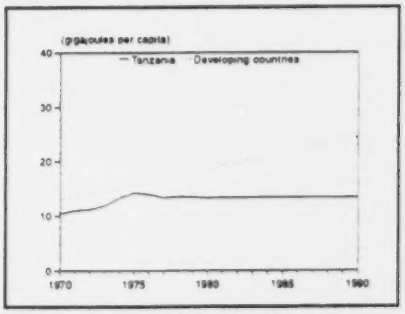
1. World Resources Institute in collaboration with the United Nations Environment Programme and the United Nations Development Programme, *World Resources 1992-93* (Oxford University Press, New York, 1992).
2. *The 1992 Information Please Environmental Almanac*, compiled by the World Resources Institute (Houghton Mifflin Co., Boston, 1991).

Figure 1 Gross National Product Per Capita
(constant 1987 US$)



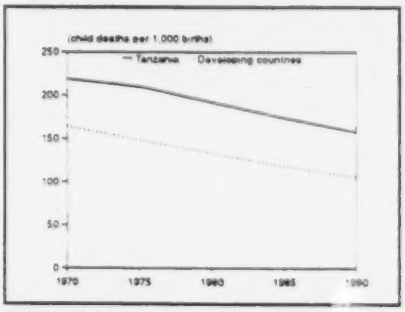
Source: The World Bank, "The World Tables, 1993" on diskette (The World Bank, Washington, D.C., 1993); United Nations Population Division (UNPD), "Interpolated National Populations (The 1992 Revision)" on diskette (UNPD, New York, 1992).

Figure 2 Energy Consumption Per Capita
(gigajoules per capita)



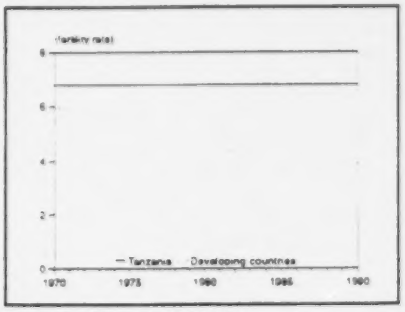
Source: United Nations Statistical Division (UNSTAT), "UN Energy Tape," on diskette (UNSTAT, New York, 1993); United Nations Population Division (UNPD), "Interpolated National Populations (The 1992 Revision)," on diskette (UNPD, New York, 1992).

Figure 3 Mortality of Children Under Age 5
(child deaths per 1,000 births)



Source: The World Bank, unpublished data (The World Bank, Washington, D.C., 1991).

Figure 4 Total Fertility Rate
(fertility rate)



Source: United Nations Population Division.

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Planning for Sustainable Development

Country _____

Step 1: Using your Country Case Study and **Handout 1, "Defining Sustainable Development,"** analyze your country's progress toward sustainable development. First, look at (1) the current status of your country's economy, (2) the quality of life in your country (human), (3) the state of the environment, and (4) whether technology in your country uses resources wisely and doesn't pollute. Each dimension contains some indicators you may want to consider.

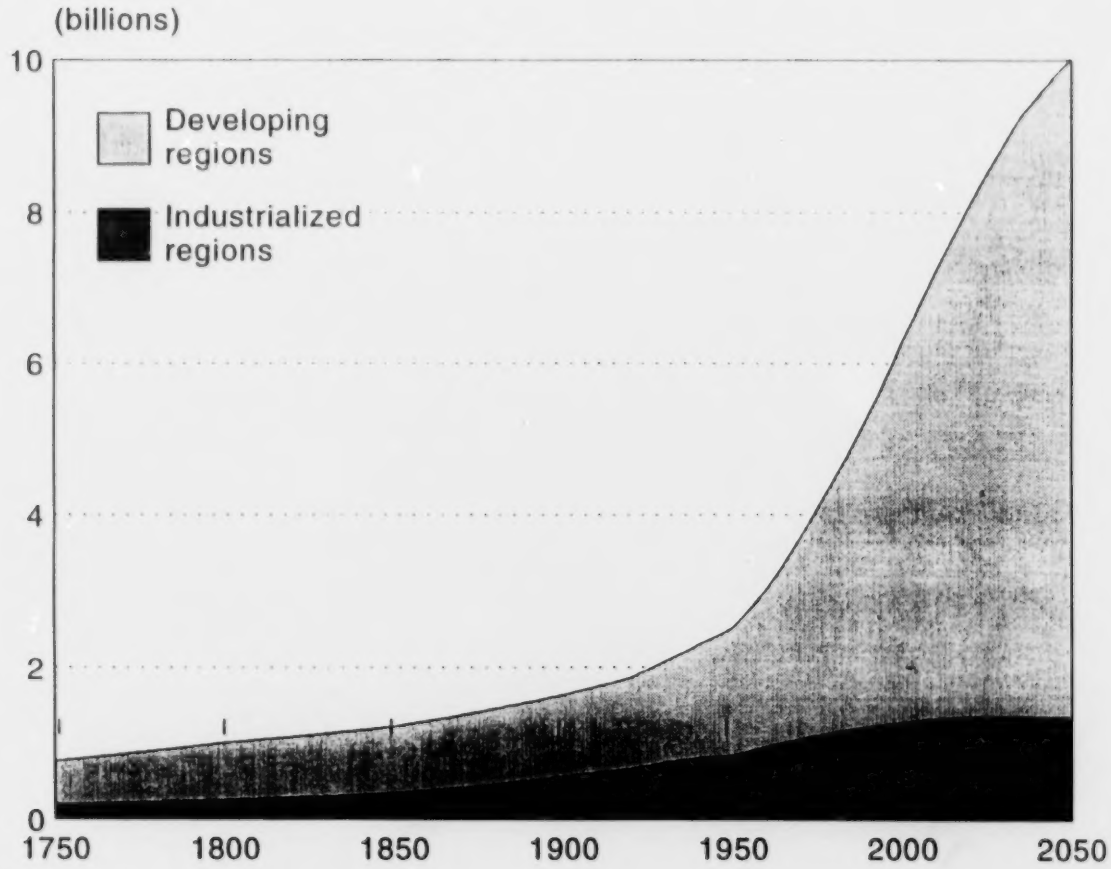
Step 2: Set some goals for sustainable development in your country. For each indicator that you selected, what goals would you set to change the current status of your country and make it more sustainable? Examples might include: "improve water quality," or "improve access to health care for women and children."

Step 3: Finally, identify ways your country can work toward these goals. What specific activities or projects would your country have to set up to accomplish each goal?

Use this form as a guide. Use additional paper as necessary.

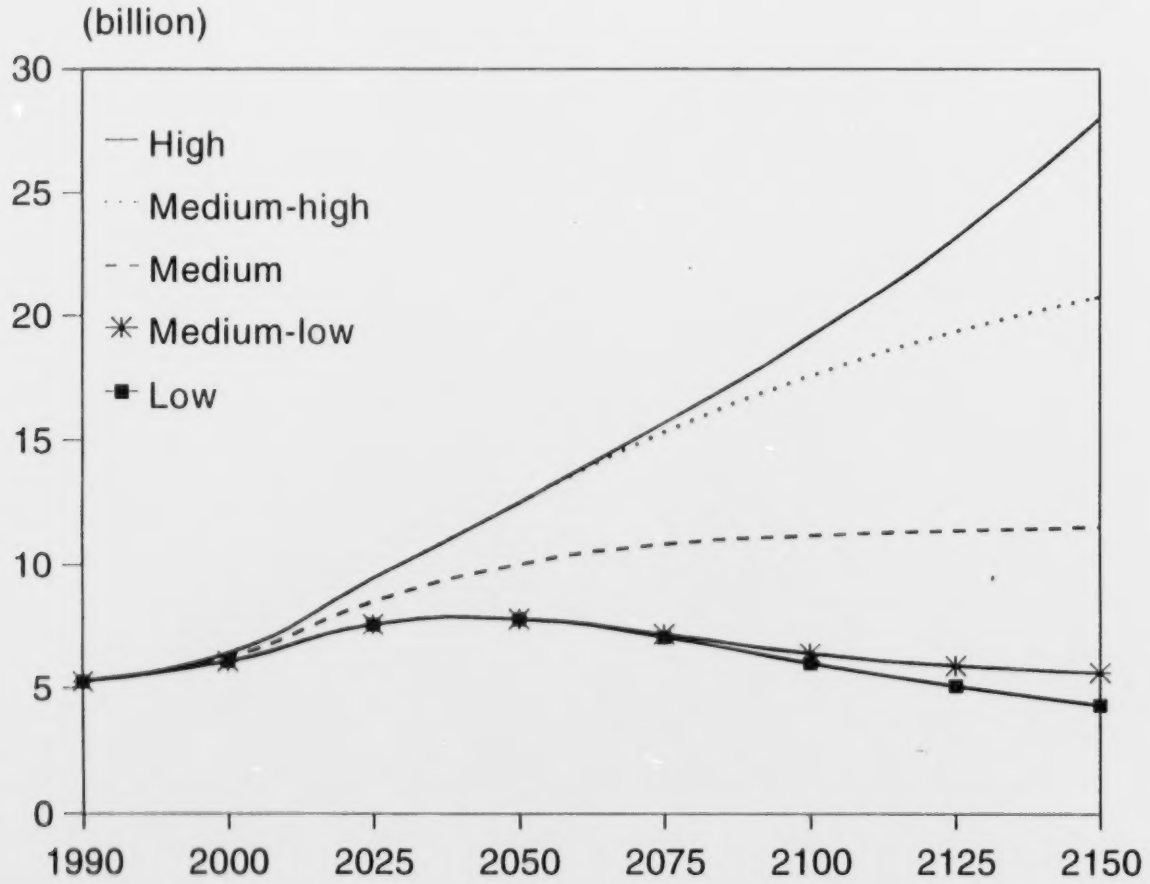
	Dimension	Step 1: Current Status	Step 2: Sustainable Development Goals	Step 3: Recommendations	
1.	**Economy** (Suggested indicators: GNP per capita; natural resources; health of the economy, including agriculture, manufacturing, and service.)			1. National policies	2. International agreements
2.	**Human** (Suggested indicators: fertility rate, literacy rate, mortality rate of children under 5.)				
3.	**Environment** (Suggested indicators: trends in land, water, forest use; loss of biodiversity; pollution levels.)				
4.	**Technology** (Suggested indicators: per capita energy consumption, carbon emissions, use of fossil fuels.)				

Trends and Projections in World Population Growth, 1750–2050



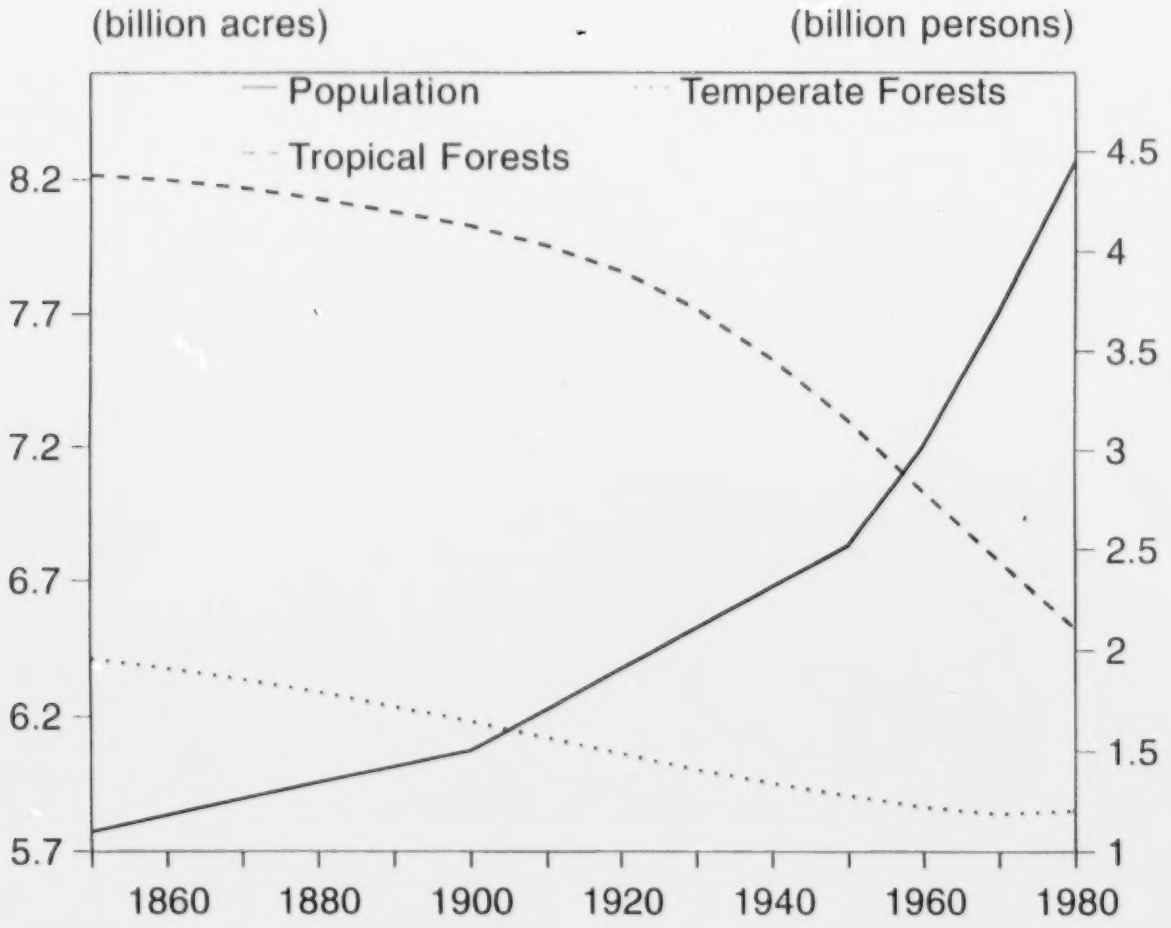
Sources: United Nations Population Division (UNDP), *Long-Range World Population Projections: Two Centuries of World Population Growth, 1950–2150* (United Nations, New York, 1992); Carl Haub, Director of International Education, Population Reference Bureau, 1993 (personal communication).

Projected Population of the World, 1990–2150



Source: United Nations Population Division (UNDP), *Long-Range World Population Projections: Two Centuries of World Population Growth, 1950–2150* (United Nations, New York, 1992) executive summary.

Trends in Deforestation and Population Growth, 1850–1980



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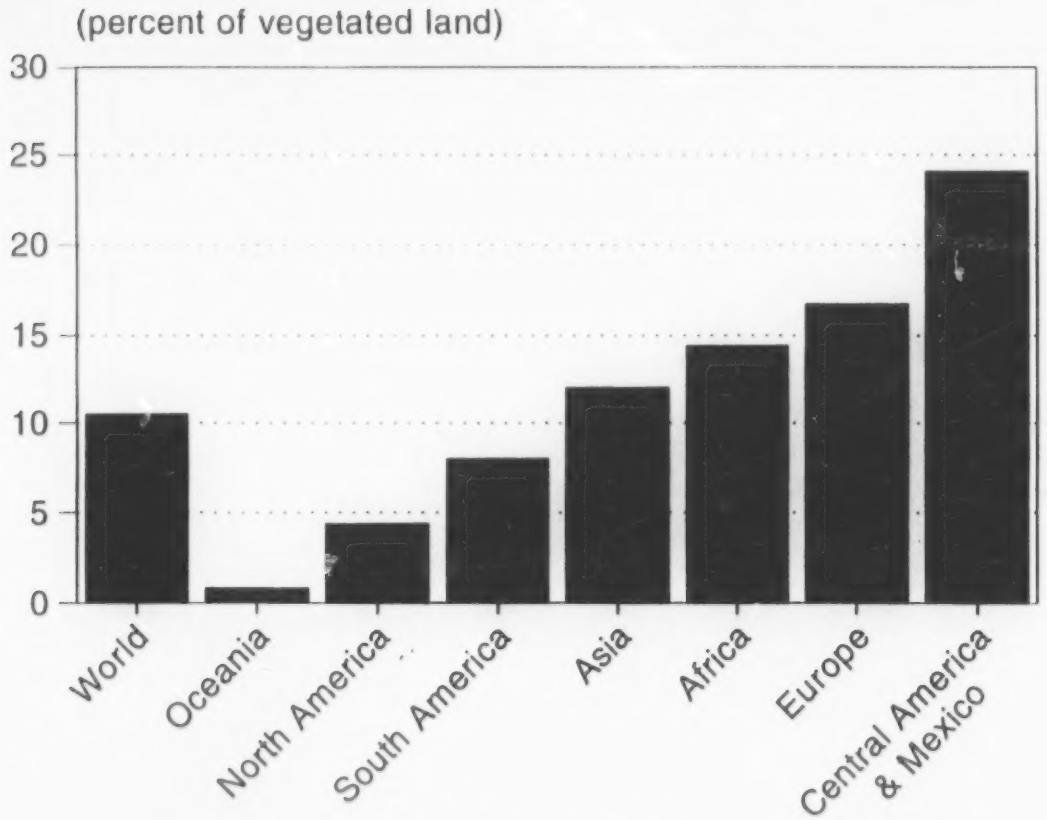
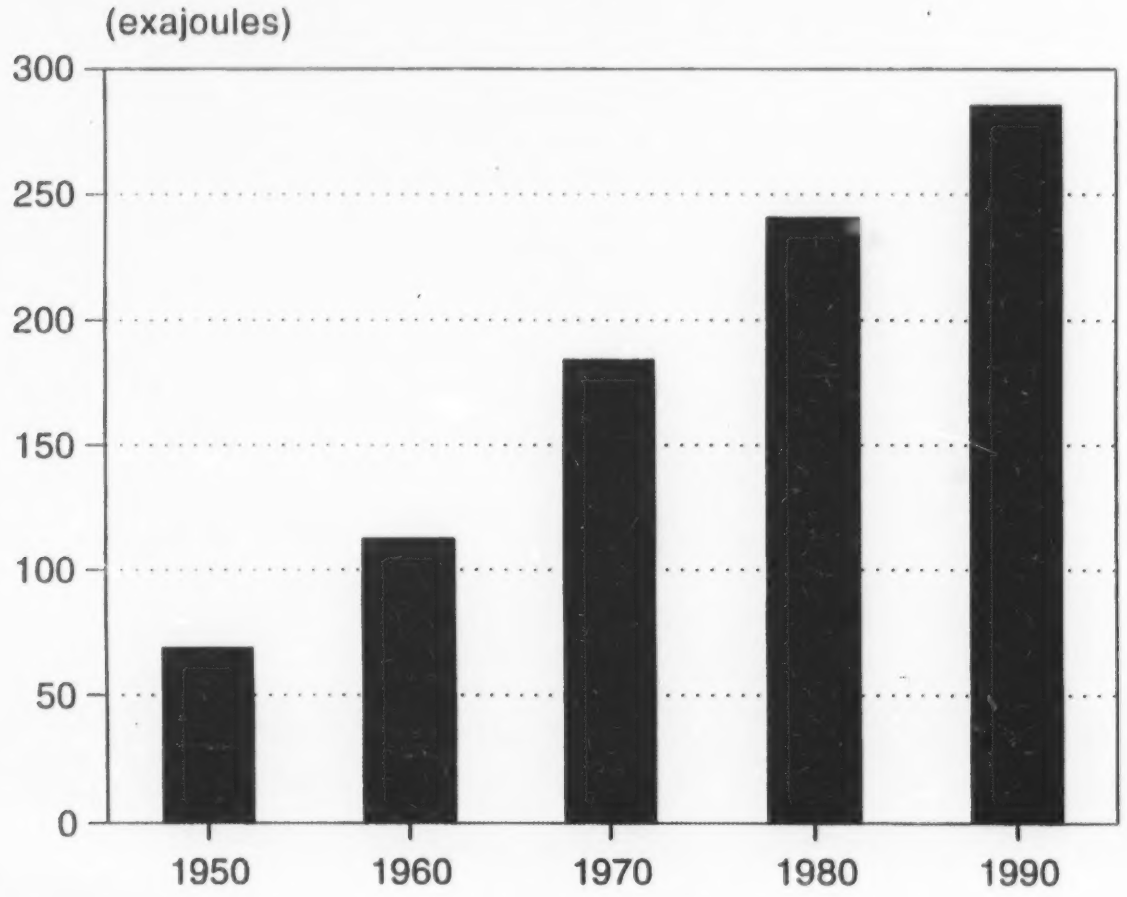
Source: World Resources Institute and The International Institute for Environment and Development, *World Resources 1987* (Basic Books, Ind., New York, 1987), Table 18.3, p. 272.

Soil Degradation as a Percent of Vegetated Land, 1945–90



Source: World Resources Institute in collaboration with the United Nations Environment Programme and the United Nations Development Programme, World Resources 1992–93 (Oxford University Press, New York, 1992), Table 8.1, p. 112.
Note: Degraded land is land that has lost some of its productive capacity due to erosion and overuse. Data for European and Asian parts of the former Soviet Union are included in Europe and Asia.

Global Fossil Fuel Consumption, 1950–90



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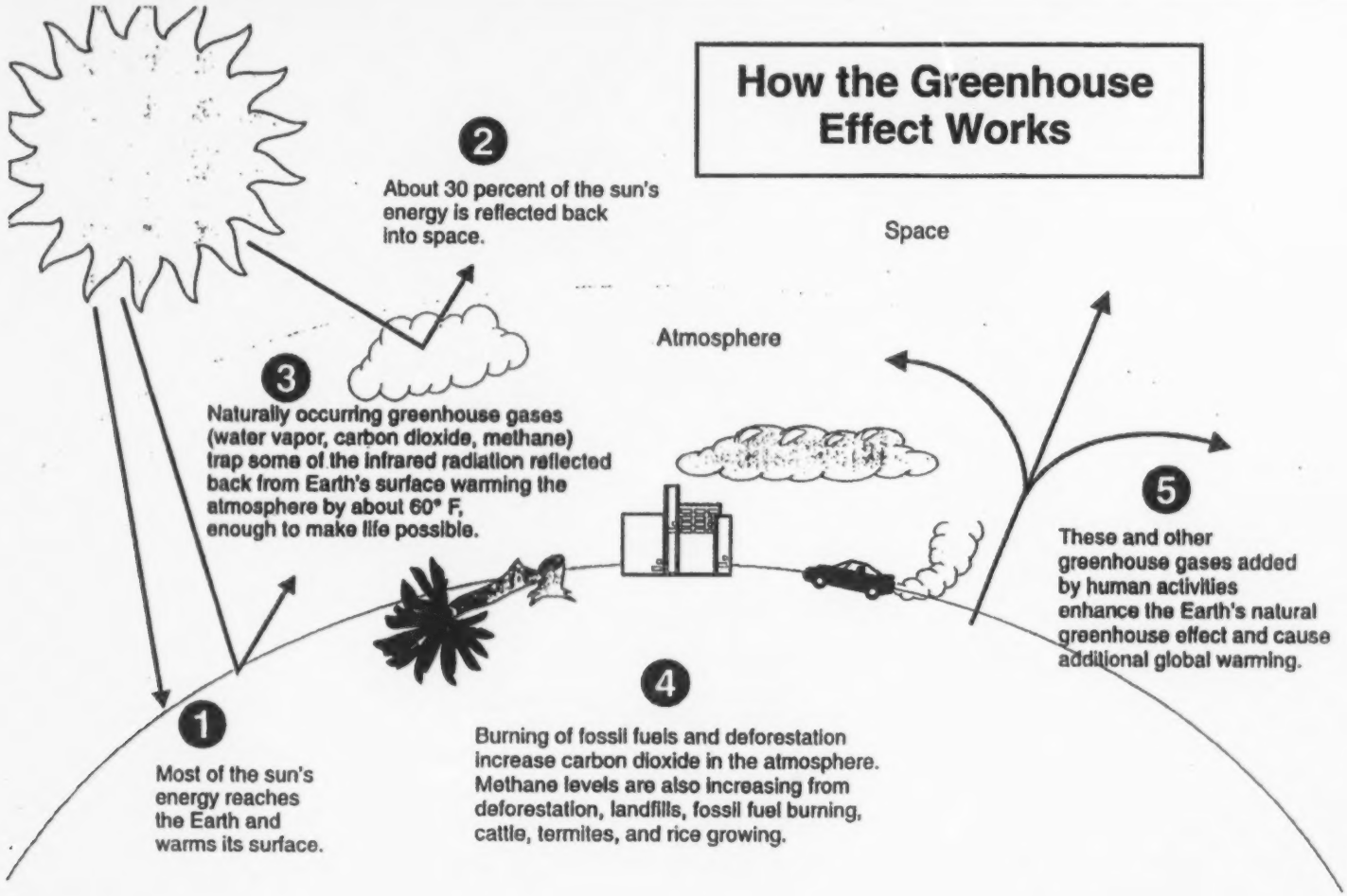
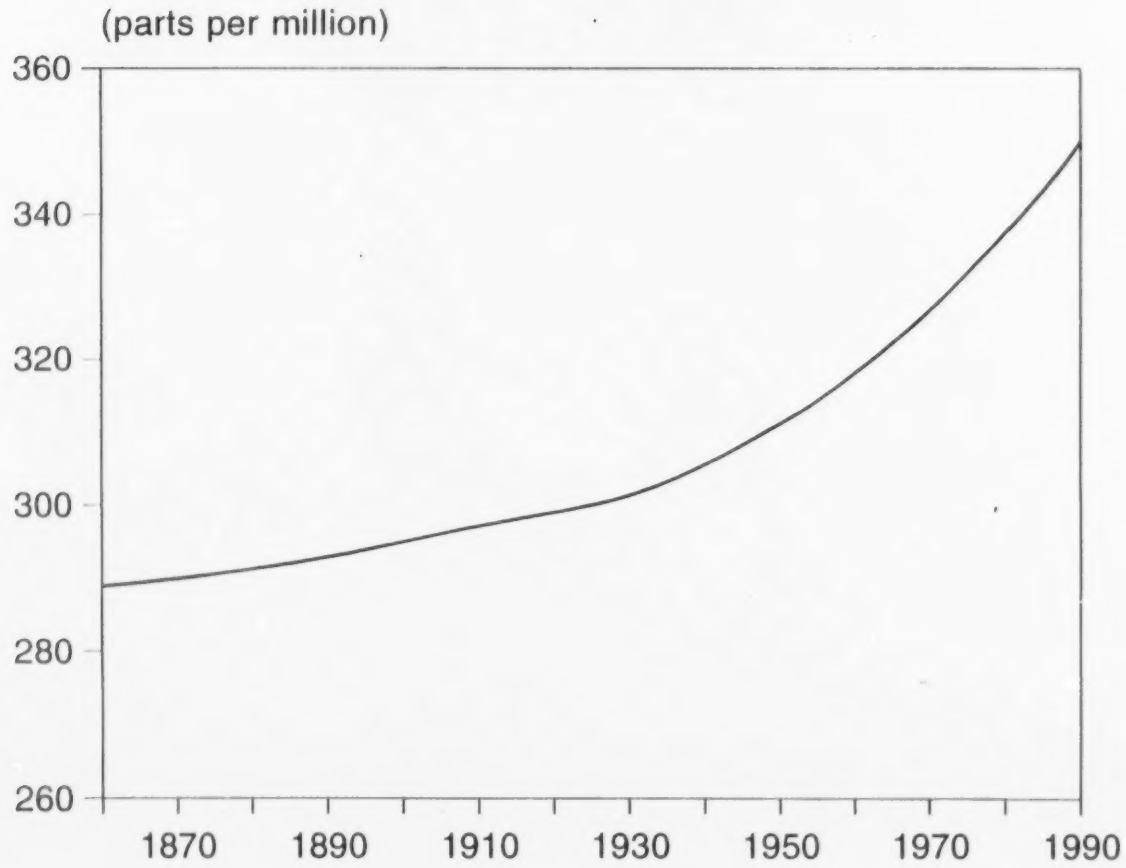
Source: United Nations (U.N.), *Energy Statiistics Yearbook 1982* (U.N., New York, 1984); United Nations Statistical Division (UNSTAT), "U.N. Energy Tape" on diskette (UNSTAT, New York, 1993).


How the Greenhouse Effect Works
2
About 30 percent of the sun's energy is reflected back into space.
Space
Atmosphere
3
Naturally occurring greenhouse gases (water vapor, carbon dioxide, methane) trap some of the infrared radiation reflected back from Earth's surface warming the atmosphere by about 60° F, enough to make life possible.
5
These and other greenhouse gases added by human activities enhance the Earth's natural greenhouse effect and cause additional global warming.
4
Burning of fossil fuels and deforestation increase carbon dioxide in the atmosphere. Methane levels are also increasing from deforestation, landfills, fossil fuel burning, cattle, termites, and rice growing.
1
Most of the sun's energy reaches the Earth and warms its surface.
Computer Graphics by Susanne Kamalieh

Source: World Resources Institute, 1989.

Atmospheric CO_2 Concentrations, 1860–1990



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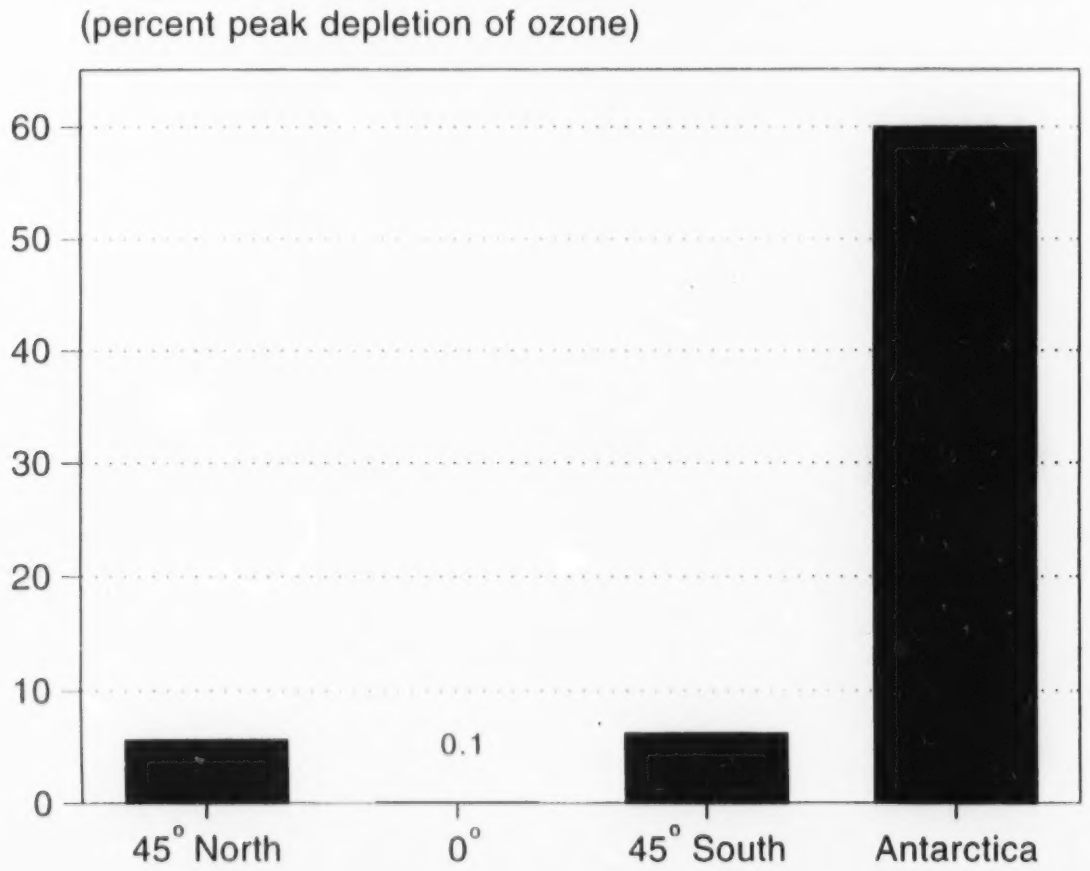
Source: Intergovernmental Panel on Climate Change (IPCC), *Climate Change: The IPCC Scientific Assessment,* J.T. Houghton, G.J. Jenkins, and J.J. Ephraums, eds. (Cambridge University Press, Cambridge, U.K., 1990), p. xvi.
Note: The line in this graph represents the average annual concentration of CO_2. Actual CO_2 levels fluctuate.

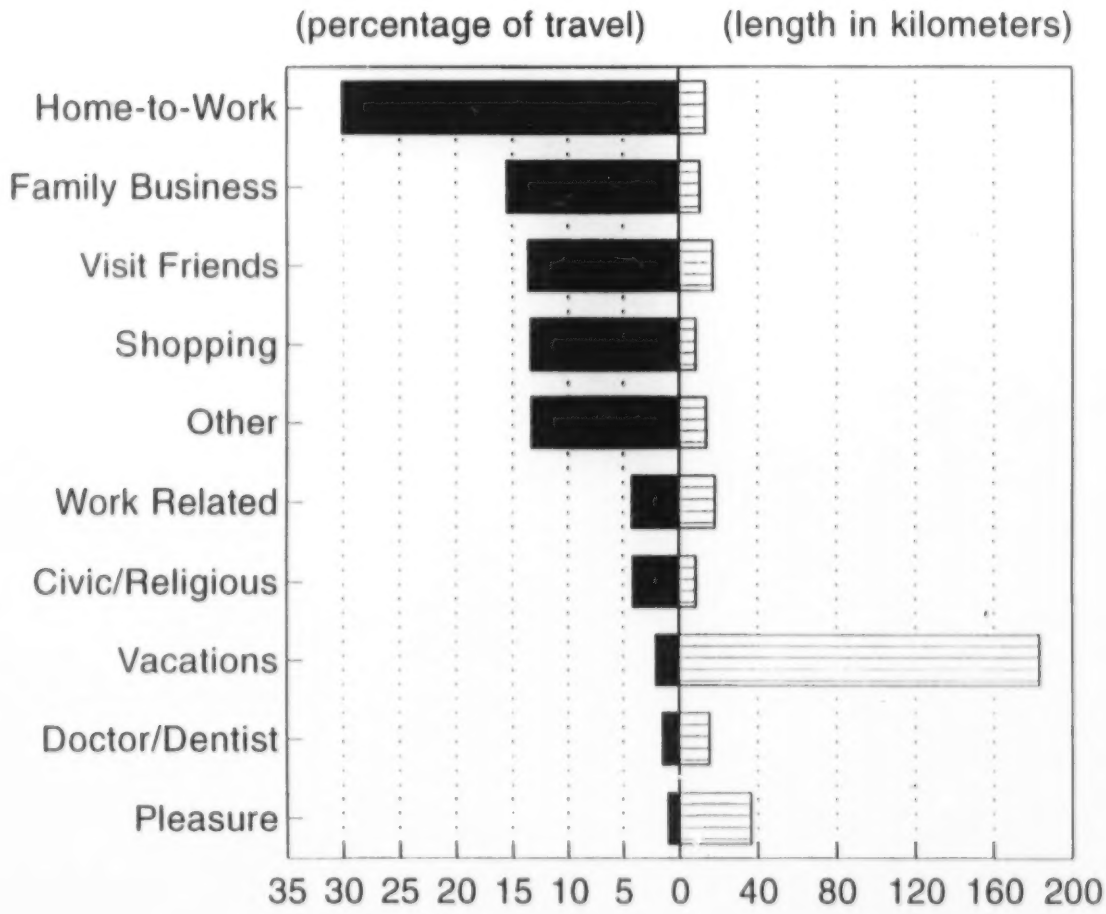
Stratospheric Ozone Depletion, 1979–91



Source: World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP), "Scientific Assessment of Stratospheric Ozone, 1991," executive summary (WMO, October 22, 1991), pp. 2 and 4.

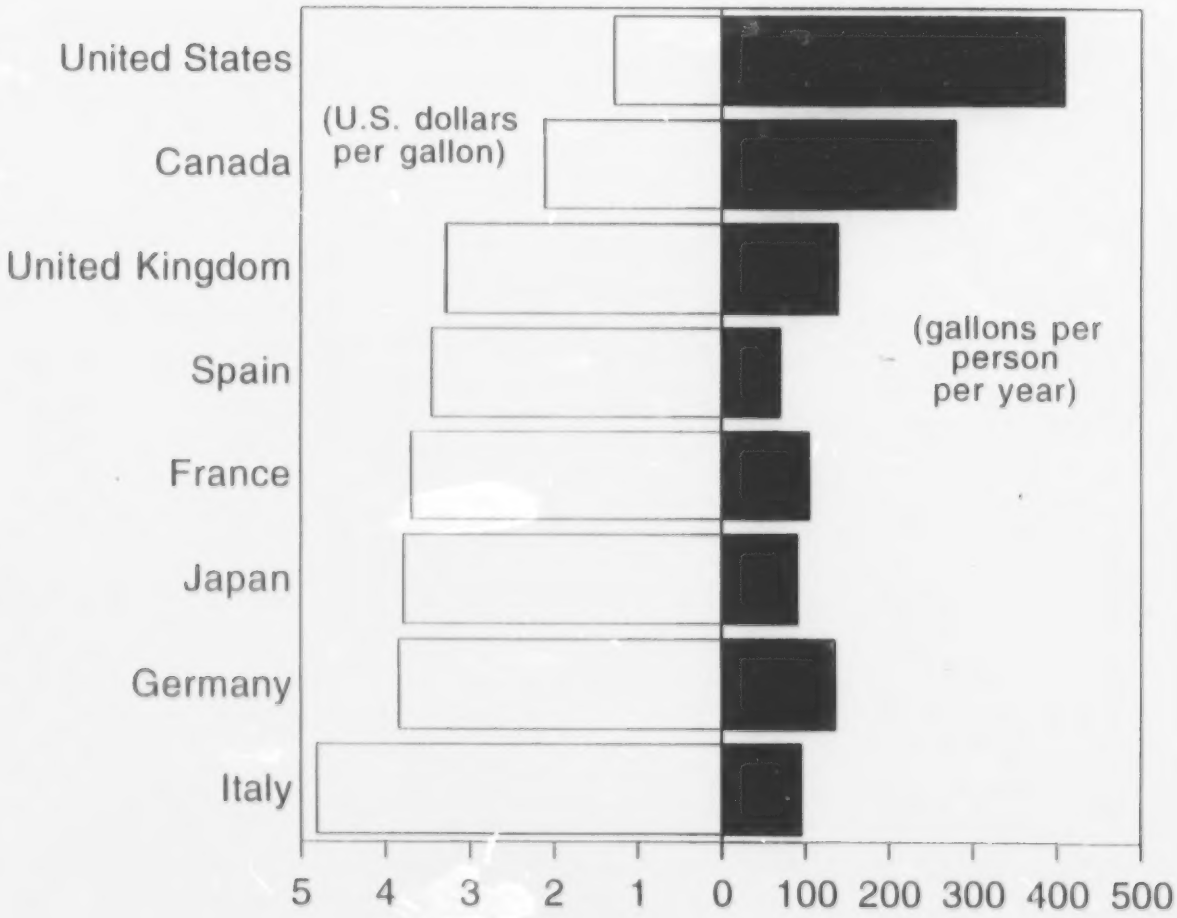
The Road To Sustainable Development

U.S. Motor Vehicle Trips by Purpose and Length, 1983–84



Source: James J. MacKenzie, "Toward a Sustainable Energy Future: The Critical Role of Rational Energy Pricing," in *WRI Issues and Ideas* (World Resources Institute, Washington,, D.C., May 1991), p. 8.

Comparison of Gasoline Prices and Motor Vehicle Use



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Source: United Nations Statistical Division (UNSTAT), "U.N. Energy Tape" on diskette (UNSTAT, New York, 1993); United Nations Population Division (UNPD), "Interpolated National Populations (The 1992 Revision)" on diskette (UNPD, New York, 1992)

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Minister of Environment
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Environment Canada
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The American Forum for
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Teacher's Survey
Teacher's Guide Units

(Please use additional paper if necessary)

1. Which *World Resources Teacher's Guide* unit did you use?

___1. Biodiversity
___2. Car Trouble
___3. Citizen Action
___4. Energy, Atmosphere, and Climate
___5. Natural Resource Economics
___6. Oceans and Coasts
___7. Population, Poverty, and Land Degradation
___8. Sustainable Development
___9. Two Giants: China and India
___10. Watershed Pollution
___11. Women, Equity, and Sustainable Development

2. Course(s) in which you used *World Resources Teacher's Guide* units?

___History ___Geography ___Science
___Ecology ___Biology ___Chemistry
___Environmental Studies ___Environmental Science ___Other

3. Which sections of the unit did you find most useful?

___Teaching Strategies
___Student Enrichment Activities
___Student Handouts
___Overhead Transparency Masters
___Reading and AV Lists

4. How much do you think you will use the *World Resources Teacher's Guide* units in the future?

___Often ___Occasionally ___Rarely

5. Did you use the Goals 2000 draft national performance standards to select material from the units?

___Yes ___No

6. If yes to the above question, which performance standards did you teach?_____

_____

7. Were the recommended activities in the unit useful in teaching those standards?

___Yes ___No

8. What features could be added to the *Teacher's Guide* to make it more useful to you?

_____

_____

_____

9. In what setting did you use the *Teacher's Guide* units?

___Middle school ___12th grade ___Nature center
___High School ___Community college ___Zoo
___10th grade ___College or university ___Museum
___11th grade ___Adult education ___Other

10. Was the material appropriate for your audience?

____Yes No, because_____

11. If you used the unit in a school, how much class time did you and your students spend on it?

____Less than 1 class ____2–3 classes ____1–2 weeks

____1 class ____4–5 classes ____More than 2 weeks

12. Do you regularly teach about global environmental issues?

____Yes ____No

13. If you don't regularly teach global environmental issues, did you find this unit offered enough information and materials to construct your lesson?

____Yes No, I also needed_____

14. Did you use other WRI materials with this unit?

____Yes ____No

If yes, which ones_____

15. Because new units of the *Teacher's Guide* are being developed, it is helpful for us to learn how the materials work. Did they engage your students? Prompt lively discussion? Help make what seemed abstract issues vivid? Please be specific with negative *or* positive comments.

_____

_____

_____

_____

Name_____

School or Organization_____

Address_____

_____

May we call you to discuss your suggestions?

____No Yes, I can be reached at_____

Please return to:

WORLD RESOURCES INSTITUTE
ATTN: Mary Paden, Teacher's Guide
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Oceans and Coasts Unit / 18 pages
Poverty, Population, & Land Degradation Unit / 19 pages
Sustainable Development Unit / 34 pages
Two Giants: China and India Unit / 78 pages
Watershed Pollution Unit / 21 pages
Women, Equity and Sustainable Development Unit / 58 pages

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